







APOLLO G & N  
EQUIPMENT TEST  
DATA SHEET 2 OF 2

JDC  
NO. 12611  
REV. B

JOB G & N COOLANT SUPPLY TURNON-TURNOFF

JDC ITEM NO	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES			MAX VALUE	REJ A/C
				1st	2nd*	3rd*		
7	PSA Coldplate Temperature Deviation	° F	-5				0	
	CDU Coldplate Temperature Deviation	° F	-8				0	
	CGC/LGC Coldplate Temperature Deviation	° F						
	PTA/PEA Coldplate Temperature Deviation	° F	-5				0	
	Circuit No. 1 Flow	cm	5.0				5.5	
8								

\* TO BE USED AS REQUIRED OR DESIRED

DATE 18 JAN 66

Rev. Let.	Date	TDRR NO.	PAGES REVISED	APPROVAL	REFERENCES
A	3-8-66	26929	1	D.S. MILG NASA	PS 6015000
B	5-25-66	29174	ALL	MMG ACNE	
C	8-28-66	29848	2	MMG	IMPORTANT (See below)
					INTERVAL
					TOOLS AND MATERIAL

- IMPORTANT: This JDC is divided into four sections which are to be performed as applicable:
- INITIAL TURN ON (Coarse Adjustment)
  - OPERATING ADJUSTMENT
  - TURN OFF
  - TURN ON (General)
- A. INITIAL TURNON (Coarse Adjustment)
- NOTE: Upon initial turnon in the G & N System configuration, the coarse adjustment of the Coolant Supply should be made as follows:
- Set the MAIN POWER switch on the G & N Coolant and Power Console to ON.
- VERIFICATION WITH SIDL REQUIRED BEFORE USE
- DATE 18 JAN 66

readings (centimeters) as a function of SUPPLY TEMP to obtain flow rates of Table 1.

4. Adjust the TEMP CONT to obtain the temperatures on the SUPPLY TEMP meter on the Coolant Supply panel as indicated in Table 1.

5. Adjust the Coolant Supply as indicated in Table 1.

Circuit No.	Supply Temperature	Approx. Flow Rate	Pump Switch
1. IMU	40(±3)°F	33(±3) lbs/hr	ON
2. Not used			OFF
3. PSA	60(±5)°F	120(±10) lbs/hr	ON
4. CDU (in series with LGC)	60(±7)°F	180(±18) lbs/hr	ON

NOTE: The IMU nulls at 450°F, the PTA, PSA and CDU Coldplates null at 72°F and the LGC Coldplate nulls at 85°F. If the Coldplates sensors are not connected, the meter will indicate off scale on the low side and cannot be nulled.

6. Allow 15 minutes and then readjust

9. Readjust the FLOW CONT and the TEMP CONT as necessary to null indications of the GSE Distribution Box temperature sensors within +0-5°F of the null point for the PSA and CDU and within ±9°F of the null point for the IMU.
- C. TURNOFF
- Set the COOLANT PUMPS POWER ON switch on the Coolant Supply panel to OFF.
  - Set the MAIN POWER switch to OFF.

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- D. TURNON (General)
- NOTE: When the complete G & N System has been in operation and the coldplate temperatures have stabilized, it should only be necessary to perform the following procedures for General turnon.
- Set the MAIN POWER switch to ON.
  - Set the COOLANT PUMPS POWER ON switch on the Coolant Supply panel to ON.
- NOTE: The coolant supply LOW FLOW indicators and the circuit 1 HIGH TEMP indicator may flash during adjustments. The COOLANT SUPPLY FAIL indicator on the Monitor panel may flash and the alarm bell may ring. Press the PUSH TO INHIB ALARM pushbutton to inhibit the alarm.
14. Wait 15 minutes and repeat step 9 as required.

DATE 18 JAN 66

NO. 12611 JDC  
REV. C  
INITIAL TDRR

ASSEMBLY UNDER TEST		TEST HISTORY				
TITLE	DATE	START	END			
SER. NO.	DWG	REV	SITE / LOCATION			
MAJOR GROUND SUPPORT EQUIPMENT		START	END			
NAME		SER. NO.	CAL DATE			
NAME		SER. NO.	CAL DATE			
CONDUCTED BY		APPROVED BY				
NAME / AFFILIATION		NAME / AFFILIATION				
JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES	MAX VALUE	REJ ACC
6	IMU Temperature Deviation	°F		1st	2nd*	3rd*
	PSA Coldplate Temperature Deviation	°F				
	CDU Coldplate Temperature Deviation	°F				
	CGC/LGC Coldplate Temperature Deviation	°F				
	PTA/PEA Coldplate Temperature Deviation	°F				
	IMU Temperature Deviation	°F				+3
7	IMU Temperature Deviation	°F				

\* TO BE USED AS REQUIRED OR DESIRED

DATE 18 JAN 66

APOLLO G & N  
EQUIPMENT TEST  
DATA SHEET 2 OF 2

JDC  
NO. 12611  
REV. C

JOB G & N COOLANT SUPPLY TURNON-TURNOFF

JDC ITEM NO	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES			MAX VALUE	REJ ACC
				1st	2nd*	3rd*		
7 (cont)	PSA Coldplate Temperature Deviation	° F	-5				0	
	CDU Coldplate Temperature Deviation	° F	-8				0	
	CGC/LGC Coldplate Temperature Deviation	° F						
	PTA/PEA Coldplate Temperature Deviation	° F						
8	Circuit No. 1 Flow	cm	5.0				5.5	

\* TO BE USED AS REQUIRED OR DESIRED

DATE 18 JAN 66

SUBSYSTEM LEM G & N SYSTEM  
DESCRIPTION Initial G and N Coolant Supply turnon and adjustment procedure. G and N Coolant Supply turnoff procedure.

Rev.	Date	TDRR NO.	PAGES REVISED	APPROVAL	REFERENCES
1	3-3-66	26929	JDC 1	MIS NASA	PS 6015000
2	5-25-66	29174	ALL 1	WKA ACME	
3	6-29-66	29848	- 2	MMF ACME	
4	8-4-66	30520	2	EA	(See below)
					INTERVAL
					TOOLS AND MATERIAL

IMPORTANT: This JDC is divided into four sections which are to be performed as applicable:

- A. INITIAL TURN ON (Coarse Adjustment)  
B. OPERATING ADJUSTMENT  
C. TURN OFF  
D. TURN ON (General)

NOTE: Upon initial turnon in the G & N System configuration, the coarse adjustment of the Coolant Supply should be made as follows:

1. Set the MAIN POWER switch on the G & N Coolant and Power Console to ON.

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the FLOW CONT and the TEMP CONT as necessary to null indicators of the GSE Distribution Box temperature sensors within +0-5°F of the null point for the PSA and CDU within ±3°F of the null point for the IMU. Record the temperature deviations from the null of all components (including the LGC and PTA).

4. Adjust the TEMP CONT to obtain the temperatures on the SUPPLY TEMP meter on the Coolant Supply panel as indicated in Table 1.

5. Adjust the Coolant Supply as indicated in Table 1.

NOTE: The IMU nulls at 45°F, the PTA, PSA and CDU Coldplates null at 72°F and the LGC Coldplate nulls at 85°F. If the Coldplates sensors are not connected, the meter will indicate off scale on the low side and cannot be nulled.

NOTE: OIA power must be on to obtain correct indications in step 6.

6. Allow 15 minutes and then readjust

the FLOW CONT and the TEMP CONT as necessary to null indicators of the GSE Distribution Box temperature sensors within +0-5°F of the null point for the PSA and CDU within ±3°F of the null point for the IMU.

C. TURNOFF

10. Set the COOLANT PUMPS POWER ON switch on the Coolant Supply panel to OFF.

11. Set the MAIN POWER switch to OFF.

the FLOW CONT and the TEMP CONT as necessary to null indicators of the GSE Distribution Box temperature sensors within +0-5°F of the null point for the PSA and CDU within ±3°F of the null point for the IMU.

C. TURNOFF

10. Set the COOLANT PUMPS POWER ON switch on the Coolant Supply panel to OFF.

11. Set the MAIN POWER switch to OFF.

the FLOW CONT and the TEMP CONT as necessary to null indicators of the GSE Distribution Box temperature sensors within +0-5°F of the null point for the PSA and CDU within ±3°F of the null point for the IMU.

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C. TURNOFF

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11. Set the MAIN POWER switch to OFF.

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C. TURNOFF

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11. Set the MAIN POWER switch to OFF.

the FLOW CONT and the TEMP CONT as necessary to null indicators of the GSE Distribution Box temperature sensors within +0-5°F of the null point for the PSA and CDU within ±3°F of the null point for the IMU.

C. TURNOFF

10. Set the COOLANT PUMPS POWER ON switch on the Coolant Supply panel to OFF.

11. Set the MAIN POWER switch to OFF.

the FLOW CONT and the TEMP CONT as necessary to null indicators of the GSE Distribution Box temperature sensors within +0-5°F of the null point for the PSA and CDU within ±3°F of the null point for the IMU.

C. TURNOFF

D. TURNON (General)

NOTE: When the complete G & N System has been in operation and the coldplate temperatures have stabilized, it should only be necessary to perform the following procedures for General turnon.

12. Set the MAIN POWER switch to ON.

13. Set the COOLANT PUMPS POWER ON switch on the Coolant Supply panel to ON.

NOTE: The coolant supply LOW FLOW indicators and the circuit 1 HIGH TEMP indicator may flash during adjustments. The COOLANT SUPPLY FAIL indicator on the Monitor panel may flash and the alarm bell may ring. Press the PUSH TO INHIB ALARM pushbutton to inhibit the alarm.

14. Wait 15 minutes and repeat step 9 as required.

NO. 12611 JDC  
REV. D  
INITIAL TDRR

ASSEMBLY UNDER TEST

TITLE DATE START END SITE / LOCATION

SER. NO. DWG REV. TIME START END TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT

NAME SER. NO. CAL. DATE

NAME SER. NO. CAL. DATE

CONDUCTED BY NAME/AFFILIATION

APPROVED BY NAME/AFFILIATION

JDC ITEM NO.

PARAMETER UNITS

MIN VALUE

RECORDED VALUES

1st 2nd\* 3rd\*

MAX VALUE

REJ. ACC

6 IMU Temperature Deviation °F

PSA Coldplate Temperature Deviation °F

CDU Coldplate Temperature Deviation °F

CGC/LGC Coldplate Temperature Deviation °F

PTA/PEA Coldplate Temperature Deviation °F

IMU Temperature Deviation °F

7

IMU Temperature Deviation °F

REJ. ACC

MAX VALUE

1st 2nd\* 3rd\*

MIN VALUE

PARAMETER UNITS

6

IMU Temperature Deviation °F

PSA Coldplate Temperature Deviation °F

CDU Coldplate Temperature Deviation °F

CGC/LGC Coldplate Temperature Deviation °F

PTA/PEA Coldplate Temperature Deviation °F

IMU Temperature Deviation °F

7

IMU Temperature Deviation °F

REJ. ACC

MAX VALUE

1st 2nd\* 3rd\*

MIN VALUE

PARAMETER UNITS

\* TO BE USED AS REQUIRED OR DESIRED

DATE 18 JAN 66

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SUBSYSTEM LEM G & N SYSTEM  
DESCRIPTION Initial G and N Coolant Supply turnon and adjustment procedure. G and N Coolant Supply turnoff procedure.

Rev. Let.	Date	TDRR NO.	PAGES REVISED	APPROVAL	REFERENCES
A	3-8-66	26929	JDC 1	M.L.G. MASAKI	PS 6015000
B	5-25-66	29174	All	M.L.G. MASAKI	
C	6-28-66	29848	2	M.L.G. MASAKI	IMPORTANT
D	8-4-66	30520	2	EAH	(See below)
E	9-22-66	31254	All	EAH	INTERVAL
					TOOLS AND MATERIAL

IMPORTANT: This JDC is divided into four sections which are to be performed as applicable:

- INITIAL TURN ON (Coarse Adjustment)
- OPERATING ADJUSTMENT
- TURN OFF
- TURN ON (General)

A. INITIAL TURNON (Coarse Adjustment)

NOTE: Upon initial turnon in the G & N System configuration, the coarse adjustment of the Coolant Supply should be made as follows:

- Set the MAIN POWER switch on the G & N Coolant and Power Console to ON.

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2. Set the COOLANT PUMP switch on the rear of the G & N Coolant and Power Console as indicated in Table 1.

NOTE: The coolant supply LOW FLOW indicators and the circuit 1 HIGH TEMP indicator may flash during steps 3 through 5. The COOLANT SUPPLY FAIL indicator on the Monitor panel may flash and the alarm bell may ring. Press the PUSH TO INHIB ALARM pushbuttons to inhibit the alarm.

- From the coolant supply CALIBRATION CHART determine FLOW indicator

SUBSYSTEM LEM G & N SYSTEM

D. TURNON (General)

NOTE: When the complete G & N System has been in operation and the coldplate temperatures have stabilized, it should only be necessary to perform the following procedures for General turnon.

- Set the MAIN POWER switch to ON.
- Set the COOLANT PUMPS POWER ON switch on the Coolant Supply panel to ON.

NOTE: The coolant supply LOW FLOW indicators and the circuit 1 HIGH TEMP indicator may flash during adjustments. The COOLANT SUPPLY FAIL indicator on the Monitor panel may flash and the alarm bell may ring. Press the PUSH TO INHIB ALARM pushbutton to inhibit the alarm.

- Wait 15 minutes and repeat step 9 as required.

DATE 18 JAN 66

SUBSYSTEM LEM G & N SYSTEM

ASSY

the FLOW CONT and the TEMP CONT as necessary to obtain negative temperature indications on the null indicator of the GSE Distribution Box. Record the temperature deviations from the null of all components (including the LGC and PTA).

- Deleted
- Deleted

B. OPERATING ADJUSTMENT  
NOTE: When advancing to the Airborne Standby and Operate modes, additional adjustments are necessary. These adjustments shall be made as required per the following procedures to maintain the specified temperature deviations.

9. Readjust the FLOW CONT and the TEMP CONT as necessary to null indications of the GSE Distribution Box temperature sensors within +0-5° F of the null point for the PSA and CDU and within ±3° F of the null point for the IMU. After temperature stabilization is obtained, record the temperature deviations from the null of all components (including the LGC and PTA). Record circuit No. 1 flow.

C. TURNOFF

- Set the COOLANT PUMPS POWER ON switch on the Coolant Supply panel to OFF.
- Set the MAIN POWER switch to OFF.

Table 1.

Circuit No.	Supply Temperature	Approx. Flow Rate	Pump Switch
1. IMU	40(±3)°F	33(±3) lbs/hr	ON
2. Not used			OFF
3. PSA	60(±5)°F	120(±10) lbs/hr	ON
4. CDU (in series with LGC)	60(±7)°F	180(±18) lbs/hr	ON

NOTE: The IMU nulls at 45°F, the PTA, PSA and CDU Coldplates null at 72°F and the LGC Coldplate nulls at 85°F. If the Coldplate sensors are not connected, the meter will indicate off scale on the low side and cannot be nulled.

NOTE: OIA power must be on to obtain correct indications in step 6.

- Allow 15 minutes and then readjust

DATE 18 JAN 66

JOB G & N COOLANT SUPPLY TURNON-TURNOFF

NO. 12611 JDC  
REV E  
INITIAL TDRR

ASSEMBLY UNDER TEST				TEST HISTORY			
TITLE		DATE		START		END	
SER. NO.		DWG		REV.		TOTAL ELAPSED	
MAJOR GROUND SUPPORT EQUIPMENT				SER. NO.			
NAME				SER. NO.			
NAME				SER. NO.			
CONDUCTED BY				APPROVED BY			
NAME/AFFILIATION				NAME/AFFILIATION			
JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES	MAX VALUE	REJ	ACC
6	IMU Temperature Deviation	°F		1st	2nd*	3rd*	
	PSA Coldplate Temperature Deviation	°F					
	CDU Coldplate Temperature Deviation	°F					
	CGC/LGC Coldplate Temperature Deviation	°F					
	PTA/PEA Coldplate Temperature Deviation	°F					
9	IMU Temperature Deviation	°F	-3				

\* TO BE USED AS REQUIRED OR DESIRED

DATE 18 JAN 66

FORM 10-43  
Chg. 7-2-65



SUBSYSTEM LEM G & N SYSTEM  
DESCRIPTION Initial G and N Coolant Supply turnon and adjustment procedure. G and N Coolant Supply turnoff procedure.

Rev. Let.	Date	TDRR NO.	PAGES REVISED	APPROVAL	REFERENCES
A	3-8-66	26929	1	JDC	PS 6015000
B	5-25-66	29174	ALL	ALL	NASA
C	6-28-66	29848	2	MMPS	ACM
D	8-4-66	30520	2	MMPS	IMPORTANT
E	9-22-66	31254	2	ALL	(See below)
F	12-15-66	32341	2	ALL	INTERVAL
					TOOLS AND MATERIAL

IMPORTANT: This JDC is divided into four sections which are to be performed as applicable:

- INITIAL TURN ON (Coarse Adjustment)
  - OPERATING ADJUSTMENT
  - TURN OFF
  - INITIAL TURN ON (Coarse Adjustment)
- NOTE: Upon initial turnon in the G & N System configuration, the coarse adjustment of the Coolant Supply should be made as follows:
1. Set the MAIN POWER switch on the rear of the G & N Coolant and Power Console to ON.
2. Set the COOLANT PUMP switch on the rear of the G & N Coolant and Power Console as indicated in Table 1.
- NOTE: The coolant supply LOW FLOW indicators and the circuit 1 HIGH TEMP indicator may flash during steps 3 through 5. The COOLANT SUPPLY FAIL indicator on the Monitor panel may flash and the alarm bell may ring. Press the PUSH TO INHIB ALARM pushbuttons to inhibit the alarm.
3. From the coolant supply CALIBRATION CHART determine FLOW indicator

1. Set the MAIN POWER switch on the rear of the G & N Coolant and Power Console to ON.

G & N Coolant and Power Console to ON.

VERIFICATION WITH SDC REQUIRED BEFORE USE

- D. TURNON (General)
- NOTE: When the complete G & N System has been in operation and the coldplate temperatures have stabilized, it should only be necessary to perform the following procedures for General turnon.
12. Set the MAIN POWER switch to ON.
13. Set the COOLANT PUMPS POWER ON switch on the Coolant Supply panel to ON.
- NOTE: The coolant supply LOW FLOW indicators and the circuit 1 HIGH TEMP indicator may flash during adjustments. The COOLANT SUPPLY FAIL indicator on the Monitor panel may flash and the alarm bell may ring. Press the PUSH TO INHIB ALARM pushbutton to inhibit the alarm.
14. Wait 15 minutes and repeat step 9 as required.

readings (centimeters) as a function of SUPPLY TEMP to obtain flow rates of Table 1.

4. Adjust the TEMP CONT to obtain the temperatures on the SUPPLY TEMP meter on the Coolant Supply panel as indicated in Table 1.

5. Adjust the Coolant Supply as indicated in Table 1.

- Deleted
- Deleted

B. OPERATING ADJUSTMENT

NOTE: When advancing to the Airborne Standby and Operate modes, additional adjustments are necessary. These adjustments shall be made as required per the following procedures to maintain the specified temperature deviations.

9. Readjust the FLOW CONT and the TEMP CONT as necessary to null indications of the GSE Distribution Box temperature sensors within  $\pm 0.5^\circ\text{F}$  of the null point for the PSA and CDU and within  $\pm 3^\circ\text{F}$  of the null point for the IMU.

C. TURNOFF

10. Set the COOLANT PUMPS POWER ON switch on the Coolant Supply panel to OFF.

11. Set the MAIN POWER switch to OFF.

NOTE: The IMU nulls at  $450^\circ\text{F}$ , the PTA, PSA and CDU Coldplates null at  $72^\circ\text{F}$  and the LGC Coldplate nulls at  $85^\circ\text{F}$ . If the Coldplates sensors are not connected, the meter will indicate off scale on the low side and cannot be nulled.

NOTE: OIA power must be on to obtain correct indications in step 6.

6. Allow 15 minutes and then readjust

NO. 12611 JDC  
REV. F  
INITIAL TDRR

TITLE		DATE		TEST HISTORY		
SER. NO.	DWG	REV.	TIME	START	END	SITE / LOCATION
MAJOR GROUND SUPPORT EQUIPMENT						
NAME						
NAME						
CONDUCTED BY						
APPROVED BY						
JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES	MAX VALUE	REJ ACC
6	IMU Temperature Deviation	$^\circ\text{F}$		1st	2nd*	3rd*
	PSA Coldplate Temperature Deviation	$^\circ\text{F}$				
	CDU Coldplate Temperature Deviation	$^\circ\text{F}$				
	CGC/LGC Coldplate Temperature Deviation	$^\circ\text{F}$				
	PTA/PEA Coldplate Temperature Deviation	$^\circ\text{F}$				
	Circuit No. 1 Flow	cm				

\* TO BE USED AS REQUIRED OR DESIRED







Rev. No.	Date	TDR NO.	PAGES REVISED	APPROVAL	REFERENCES
1	4-14-66	28075	2	JDC D.S. - WK 4 ACMT	PS 6015000
					IMPORTANT Steps 2 thru 5 must be performed in less than 15 minutes
					INTERVAL
					TOOLS AND MATERIAL

- PROCEDURE
- If the Temperature Monitor Control is in functioning any temperature failure.
- Set the PRIME POWER CIRCUIT BREAKER on the back of the OIA and Oscillograph Console to ON.
  - Set the PTC POWER switch to OFF.
  - Remove the PTC power cable connector P2 from IMU connector 35AJ11.
  - Connect "B" Harness connector 56P21 to IMU connector 35AJ11.
  - Connect W120 connector P2 to "B" Harness connector 56J1.
  - Insure that the SENSOR selector on the Temperature Monitor Control panel is in the IMU position.
  - Reset the TEMP CONTROL PUSH RESET/CONTROL FAIL on the Monitor panel

VERIFICATION WITH SIDL REQUIRED BEFORE USE

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- OIA VOLTAGE MEASUREMENT
- 1A. Measure the following voltages on the DVM by setting the CROSSBAR CONTROL on the Primary Signal Selector panel as indicated:
- Voltage
- CROSSBAR CONTROL
- 115V 60 cps GSE  $\phi$ A 279
  - 115V 60 cps GSE  $\phi$ B 180
  - 115V 60 cps GSE  $\phi$ C 280
  - 27VDC GSE Relay Power 179
  - 28VDC Var Bus Remote Sense 171
  - +30VDC GSE Electronics 170
  - 30VDC GSE Electronics 270
  - 115V 400 cps 177

- COMPUTER TEST SET SWITCHES
15. Set switches on the Computer Test Set as follows:
- Power Control panel - All switches set to OFF and the RANGE SELECT to 1000V.
  - AC Input panel - STA POWER to OFF.
  - Tape Perforator panel - ON/OFF to OFF.
  - Logic Drawer No. 1 - All switches fully CCW.
  - Logic Drawer No. 2 - All switches to OFF.
  - Programmer And Monitor panel - REGISTER SELECT to OFF
  - TEST MODE to SYSTEM
  - MODE CONTROL to Any Position
  - Power Supply panel - All switches to ON position.

DATE 15 MAR 66

- ROTARY TABLE POSITIONING
- Obtain and record  $\phi_{21}$  and  $\phi_{22}$  (Tilt angle readout + indicator error) from JDC 16011.
  - Obtain and record  $\epsilon_{CZ}$  from the Mounting Fixture calibration decal.
  - Obtain and record  $\epsilon_{TC}$  150° (Average rotary table tilt axis error) from the rotary table tilt axis error) from the Calibration Chart in Section II of the Data Sheets of JDC 19728 for a rotary angle of 150°.
  - Calculate the calibrated rotary axis position  $\theta$ .
- $$\theta = \frac{\phi_{21} + \phi_{22}}{2} - \epsilon_{TC} 150^\circ + \epsilon_{CZ}$$
- Calculate the calibrated tilt axis Position 1 angle ( $\phi$ ).
- $$\phi_1 = \frac{\phi_{21} + \phi_{22}}{2} + 90^\circ - \epsilon_{TD} 90^\circ - \epsilon_{CY}$$
- Calculate the calibrated tilt axis Position 2 angle ( $\phi$ ).
- $$\phi_2 = \frac{\phi_{21} + \phi_{22}}{2} - \epsilon_{TD} 0^\circ - \epsilon_{CY}$$

DATE 15 MAR 66

JOB GROUND SUPPORT EQUIPMENT TURNON

ASSEMBLY UNDER TEST		TEST HISTORY	
TITLE		DATE	END
SER. NO.	DWG	TIME	END
MAJOR GROUND SUPPORT EQUIPMENT		TOTAL ELAPSED	
NAME	SER. NO.	SER. NO.	CAL DATE
NAME	SER. NO.	SER. NO.	CAL DATE
CONDUCTED BY NAME/AFFILIATION			
APPROVED BY NAME/AFFILIATION			

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ ACC
11	Accel. Temp	VDC	-2.5		+2.5	
12	IRIG Temp	VDC	-3.25		+4.0	
14.a	115V, 60 cps $\phi$ A	VAC	105		125	
14.b	115V, 60 cps $\phi$ B	VAC	105		125	
14.c	115V, 60 cps $\phi$ C	VAC	105		125	
14.d	27 VDC	VDC	25		29	
14.e	28 VDC	VDC	26		31	
14.f	+30 VDC GSE	VDC	28		32	
14.g	-30 VDC GSE	VDC	-28		-32	
14.h	115V, 400 cps	VAC	112.5		117.5	
16	$\phi_{21}$	Deg.				
	$\phi_{22}$	Deg.				
17	$\epsilon_{CY}$	Deg.				
18	$\epsilon_{TD}$	Deg.				

DATE 15 MAR 66

APOLLO 88N  
EQUIPMENT TEST  
DATA SHEET 2 OF 3

JDC  
NO. 12612  
REV. A

JOB GROUND SUPPORT EQUIPMENT TURNON

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REQ ACC
19	$\phi_1$	Deg.		° ' "		
20	$\phi_2$	Deg.		° ' "		
21	$\theta_{31}$	Deg.		° ' "		
	$\theta_{32}$	Deg.		° ' "		
22	$\epsilon CZ$	Deg.		° ' "		
23	$\epsilon TC 150^\circ$	Deg.		° ' "		
24	$\theta$	Deg.		° ' "		

DATE 15 MAR '66

APOLLO 88N  
EQUIPMENT TEST  
DATA SHEET 3 OF 3

JDC  
NO. 12612  
REV. A

JOB GROUND SUPPORT EQUIPMENT TURNON

JDC ITEM NO.	CALCULATIONS
19	$\phi_1 = \frac{\phi_{21} + \phi_{22}}{2} + 90^\circ - \epsilon TD 90^\circ - \epsilon cy$
20	$\phi_2 = \frac{\phi_{21} + \phi_{22}}{2} - \epsilon TD 0^\circ - \epsilon cy$
24	$\theta = \frac{\theta_{31} + \theta_{32}}{2} - \epsilon TC 150^\circ + \epsilon CZ$

DATE 15 MAR '66

SUBSYSTEM LEM G & N SYSTEM  
DESCRIPTION Turnon ground support equipment for G & N System Test including Rotary and Tilt Axis calibrated angle determination and positioning.

Rev.	Let.	Date	TDRR NO.	PAGES REVISED	APPROVAL	REFERENCES
A	43466	28075	2	D.S.	MIT, NASA	PS 6015000
B	5-25-66	29175	2, 3	-	WK 4, ACN 4, MM 4, ACN 4	
IMPORTANT Steps 2 thru 5 must be performed in less than 15 minutes						
INTERVAL						
TOOLS AND MATERIAL						

PROCEDURE  
TEMPERATURE CONTROL SWITCHOVER  
1. Set the PRIME POWER CIRCUIT BREAKER on the back of the OIA and Oscillograph Console to ON.  
2. Set the PTC POWER switch to OFF.  
3. Remove the PTC power cable connector P2 from IMU connector 56P21.  
4. Connect "B" Harness connector 56P21 to IMU connector 35A1J1.  
5. Connect W120 connector P2 to "B" Harness connector 56J1.  
6. Insure that the SENSOR selector on the Temperature Monitor Control panel is in the IMU position.  
7. Reset the TEMP CONTROL PUSH RESET/CONTROL FAIL on the Monitor panel

If the Temperature Monitor Control is indicating any temperature failure.  
8. The AUX HTR PWR lamp on the Temperature Monitor Control panel shall be lighted.  
9. Press the OIA ON pushbutton on the Test Control panel.  
10. Set the POWER switch on the Digital Voltmeter panel to ON.  
11. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 255. Measure and record the Accelerometer temperature voltage as indicated on the DVM.  
12. Set the CROSSBAR CONTROL to 156. Measure and record the IRIG temperature voltage.  
13. Allow 30 minutes warm up for the GSE.

VERIFICATION WITH SID REQUIRED BEFORE USE  
DATE 15 MAR 66

FORM 100-13  
O&G 7-66

r. Programmer and Monitor panel -  
Press the MONITOR MODE CONTROL pushbutton. The pushbutton shall light. Press the VERIFY FAIL RESET pushbutton if the VERIFY FAIL lamp is lighted. The VERIFY FAIL lamp shall go out.

24. Calculate the calibrated rotary axis position  $\theta$ .  
$$\theta = \frac{\theta_{31} + \theta_{32}}{2} - \epsilon_{TC} 150^\circ + \epsilon_{CZ}$$

25. Set the Rotary table axis to the angles calculated in steps 19 and 24.

ROTARY TABLE POSITIONING  
16. Obtain and record  $\theta_{21}$  and  $\theta_{22}$  (Tilt angle readout + indicator error) from JDC 16011.  
17. Obtain and record  $\epsilon_{cy}$  from the Mounting Fixture calibration decal.  
18. Obtain and record  $\epsilon_{TD}$  (average rotary table tilt axis error) from the Calibration Chart in Section II of the Data Sheets of JDC 19728 for a rotary angle of  $90^\circ$  and  $0^\circ$  respectively.  
19. Calculate the calibrated tilt axis Position 1 angle ( $\phi$ ).  
$$\phi_1 = \frac{\theta_{21} + \theta_{22}}{2} + 90^\circ - \epsilon_{TD} 90^\circ - \epsilon_{cy}$$
  
20. Calculate the calibrated tilt axis Position 2 angle ( $\phi$ ).  
$$\phi_2 = \frac{\theta_{21} + \theta_{22}}{2} - \epsilon_{TD} 0^\circ - \epsilon_{cy}$$
  
21. Obtain and record  $\theta_{31}$  and  $\theta_{32}$  (Rotary angle readout + indicator error) from JDC 10612.  
22. Obtain and record  $\epsilon_{CZ}$  from the Mounting Fixture calibration decal.  
23. Obtain and record  $\epsilon_{TC} 150^\circ$  (Average rotary table rotary axis error) from Section I of the Data Sheets of JDC 19728 for a rotary angle of  $150^\circ$ .

DATE 15 MAR 66

h. Frequency Counter panel -  
FUNCTION to TIME A  $\rightarrow$  B  
FREQ-TIME to SEC  
POWER to ON  
GATE to AUTO  
TRIGGER LEVEL to Any Position  
INPUT VOLTS RMS to any position  
1. Power Control panel -  
VOLTAGE SELECT to AGC-OFF  
RANGE SELECT to 1000V  
AGC VOLTAGE switches to OFF  
STATION to ON  
TEST SET to ON  
ACVM to ON  
j. Oscilloscope panel  
SCALE ILLUM - Any position but OFF  
k. XY Interface panel  
SCOPE to OFF  
FREQ + PHASE to OFF  
OUT  $\rightarrow$  IN to OFF  
Y MARGINS to NORM  
l. RDC Interface panel -  
CHAN V METERS to OFF  
DE MARGINS to NORM  
All others fully CCW  
m. Tape Recorder panel - ON/OFF to OFF  
n. Self Test panel - none  
o. Power Supply 3 VDC panel -  
All switches to ON  
INDICATOR SELECTOR switch to VOLTAGE REGULATED  
p. AC Input panel (Back of Console)  
STA POWER to ON  
AUX OUTLETS to OFF  
q. XY Interface panel - Press the DL ENABLE and WORD RATE 50 PPS pushbuttons. The pushbuttons shall light.

14. Measure the following voltages on the DVM by setting the CROSSBAR CONTROL on the Primary Signal Selector panel as indicated:  
Voltage  
CROSSBAR CONTROL  
a. 115V 60 cps GSE  $\phi A$  279  
b. 115V 60 cps GSE  $\phi B$  180  
c. 115V 60 cps GSE  $\phi C$  280  
d. 27VDC GSE Relay Power 179  
e. 28VDC Var Bu.s Remote Sense 171  
f. +30VDC GSE Electronics 170  
g. -30VDC GSE Electronics 270  
h. 115V 400 cps 177  
15. Set switches on the Computer Test Set as follows:  
a. Power Control panel -  
All switches set to OFF  
RANGE SELECT to 1000V  
ACVM range switch to 500V  
b. AC Input panel - STA POWER to OFF.  
c. Tape Perforator panel - ON/OFF to OFF.  
d. Logic Drawer No. 1 - All switches fully CCW.  
e. Logic Drawer No. 2 - All switches to OFF.  
f. Programmer And Monitor panel -  
REGISTER SELECT to OFF  
TEST MODE to SYSTEM  
MODE CONTROL to Any Position  
g. Power Supply panel - All switches to ON position.

DATE 15 MAR 66

NO. 12612 JDC  
REV B  
INITIAL TDRR

ASSEMBLY UNDER TEST			TEST HISTORY		
TITLE	DATE	START	END	SITE / LOCATION	
SER. NO.	DWG	REV.	END	TOTAL ELAPSED	
MAJOR GROUND SUPPORT EQUIPMENT					
CONDUCTED BY: NAME/AFFILIATION APPROVED BY: NAME/AFFILIATION					
JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE REJ ACC
11	Accel. Temp	VDC	-2.5		+2.5
12	IRIG Temp	VDC	-3.25		+4.0
14.a	115V, 60 cps $\phi A$	VAC	105		125
14.b	115V, 60 cps $\phi B$	VAC	105		125
14.c	115V, 60 cps $\phi C$	VAC	105		125
14.d	27 VDC	VDC	25		29
14.e	28 VDC	VDC	26		31
14.f	+30 VDC GSE	VDC	28		32
14.g	-30 VDC GSE	VDC	-28		-32
14.h	115V, 400 cps	VAC	112.5		117.5
16	$\phi_{21}$	Deg.			
	$\phi_{22}$	Deg.			
17	$\epsilon_{cy}$	Deg.			
18	$\epsilon_{TD}$	Deg.			



JOB GROUND SUPPORT EQUIPMENT TURNON

SUBSYSTEM LEM G & N SYSTEM  
DESCRIPTION Turnon ground support equipment for G & N System Test including Rotary and Tilt Axis calibrated angle determination and positioning.

Rev.	Date	TORR NO.	PAGES REVISED	APPROVAL	REFERENCES
1	A 114-66	28075	JDC D.S.	M.T. NASA	PS 6015000
2	B 25-66	29175	2	WR # ACMM	
3	C 16-66	29679	3	MM # ACMM	IMPORTANT Steps 2 thru 5 must be performed in less than 15 minutes
					INTERVAL
					TOOLS AND MATERIAL

- PROCEDURE
- If the Temperature Monitor Control is indicating any temperature failure.
- TEMPERATURE CONTROL SWITCHOVER
1. Set the PRIME POWER CIRCUIT BREAKER on the back of the OIA and Oscillograph Console to ON.
  2. Set the PTC POWER switch to OFF.
  3. Remove the PTC power cable connector P2 from IMU connector 35AJ1.
  4. Connect "B" Harness connector 56P21 to IMU connector 35AJ1.
  5. Connect W120 connector P2 to "B" Harness connector 56J1.
  6. Insure that the SENSOR selector on the Temperature Monitor Control panel is in the IMU position.
  7. Reset the TEMP CONTROL PUSH RESET/CONTROL FAIL on the Monitor panel.
- VERIFICATION WITH SIDL REQUIRED BEFORE USE
- DATE 15 MAR 66

SUBSYSTEM LEM G & N SYSTEM

ASSY

h. Frequency Counter panel - FUNCTION to TIME A → B

14. Measure the following voltages on the DVM by setting the CROSSBAR CONTROL on the Primary Signal Selector panel as indicated:

Voltage CROSSBAR CONTROL

- a. 115V 60 cps GSE φ A 279
- b. 115V 60 cps GSE φ B 180
- c. 115V 60 cps GSE φ C 280
- d. 27VDC GSE Relay Power 179
- e. 28VDC Var Buss Remote Sense 171
- f. +30VDC GSE Electronics 170
- g. -30VDC GSE Electronics 270
- h. 115V 400 cps 177

COMPUTER TEST SET SWITCHES

15. Set switches on the Computer Test Set as follows:

- a. Power Control panel - All switches set to OFF
- b. AC Input panel - STA POWER to OFF.
- c. Tape Perforator panel - ON/OFF to OFF.
- d. Logic Drawer No. 1 - All switches fully CCW.
- e. Logic Drawer No. 2 - All switches to OFF.
- f. Programmer And Monitor panel - REGISTER SELECT to OFF
- g. Power Supply panel - All switches to ON position.

DATE 15 MAR 66

SUBSYSTEM LEM G & N SYSTEM

ASSY

1. Programmer and Monitor panel - Press the MONITOR MODE CONTROL pushbutton. The pushbutton shall light. Press the VERIFY FAIL RESET pushbutton if the VERIFY FAIL lamp is lighted. The VERIFY FAIL lamp shall go out.
- ROTARY TABLE POSITIONING
16. Obtain and record φ<sub>21</sub> and φ<sub>22</sub> (Tilt angle readout + indicator error) from JDC 16011.
  17. Obtain and record ε<sub>CY</sub> from the Mounting Fixture calibration decal.
  18. Obtain and record ε<sub>TD</sub> (average rotary table tilt axis error) from the Calibration Chart in Section II of the Data Sheets of JDC 19728 for a rotary angle of 90° and 0° respectively.
  19. Calculate the calibrated tilt axis Position 1 angle (φ).  
$$\phi_1 = \frac{\phi_{21} + \phi_{22}}{2} + 90^\circ - \epsilon_{TD} 90^\circ - \epsilon_{CY}$$
  20. Calculate the calibrated tilt axis Position 2 angle (φ).  
$$\phi_2 = \frac{\phi_{21} + \phi_{22}}{2} - \epsilon_{TD} 0^\circ - \epsilon_{CY}$$
  21. Obtain and record θ<sub>31</sub> and θ<sub>32</sub> (Rotary angle readout + indicator error) from JDC 16012.
  22. Obtain and record ε<sub>CZ</sub> from the Mounting Fixture calibration decal.
  23. Obtain and record ε<sub>TC</sub> 150° (Average rotary table rotary axis error) from Section I of the Data Sheets of JDC 19728 for a rotary angle of 150°.

APOLLO 68N  
EQUIPMENT TEST  
DATA SHEET 1 OF 3

JOB GROUND SUPPORT EQUIPMENT TURNON

ASSEMBLY UNDER TEST		TEST HISTORY	
TITLE	DATE	START	END
SER. NO.	DWG	REV	SITE / LOCATION
MAJOR GROUND SUPPORT EQUIPMENT		END	TOTAL ELAPSED
NAME		SER. NO.	CAL DATE
NAME		SER. NO.	CAL DATE
CONDUCTED BY		APPROVED BY	
NAME/AFFILIATION		NAME/AFFILIATION	

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ ACC
11	Accel. Temp	VDC	-2.5		+2.5	
12	IRIG Temp	VDC	-3.25		+4.0	
14.a	115V, 60 cps φ A	VAC	105		125	
14.b	115V, 60 cps φ B	VAC	105		125	
14.c	115V, 60 cps φ C	VAC	105		125	
14.d	27 VDC	VDC	25		29	
14.e	28 VDC	VDC	26		31	
14.f	+30 VDC GSE	VDC	28		32	
14.g	-30 VDC GSE	VDC	-28		-32	
14.h	115V, 400 cps	VAC	112.5		117.5	
16	φ <sub>21</sub>	Deg.				
	φ <sub>22</sub>	Deg.				
17	ε <sub>CY</sub>	Deg.				
18	ε <sub>TD</sub>	Deg.				

DATE 15 MAR 66

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APOLLO G&N  
EQUIPMENT TEST  
DATA SHEET 2 OF 3

JDC  
NO. 12612  
REV. C

JOB GROUND SUPPORT EQUIPMENT TURNON

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ ACC
19	$\phi_1$	Deg.		° ' "		
20	$\phi_2$	Deg.		° ' "		
21	$\theta_{31}$	Deg.		° ' "		
	$\theta_{32}$	Deg.		° ' "		
22	$\epsilon CZ$	Deg.		° ' "		
23	$\epsilon TC 150^\circ$	Deg.		° ' "		
24	$\theta$	Deg.		° ' "		

DATE 15 MAR 66

APOLLO G&N  
EQUIPMENT TEST  
DATA SHEET 3 OF 3

JDC  
NO. 12612  
REV. C

JOB GROUND SUPPORT EQUIPMENT TURNON

JDC ITEM NO.	CALCULATIONS
19	$\phi_1 = \frac{\phi_{21} + \phi_{22}}{2} + 90^\circ - \epsilon TD 90^\circ - \epsilon cy$
20	$\phi_2 = \frac{\phi_{21} + \phi_{22}}{2} - \epsilon TD 0^\circ - \epsilon cy$
24	$\theta = \frac{\theta_{31} + \theta_{32}}{2} - \epsilon TC 150^\circ + \epsilon CZ$

DATE 15 MAR 66

SUBSYSTEM LEM G & N SYSTEM  
DESCRIPTION Turnon ground support equipment for G & N System Test including Rotary and Tilt Axis calibrated angle determination and positioning.

Rev.	Let.	Date	TDOR NO.	PAGES REVISED	APPROVAL	REFERENCES
1	A	4-14-66	23075	2	MIT NASA	PS 6015000
2	B	5-25-66	29175	2,3	WKA ACN	
3	C	6-16-66	29679	3	MMW ACN	IMPORTANT Steps 2 thru 5 must be performed in less than 15 minutes
4	D	8-4-66	30516	3	EA	INTERVAL
						TOOLS AND MATERIAL

- PROCEDURE
- If the Temperature Monitor Control is indicating any temperature failure.
8. The AUX HTR PWR lamp on the Temperature Monitor Control panel shall be lighted.
9. Press the OIA ON pushbutton on the Test Control panel.
10. Set the POWER switch on the Digital Voltmeter panel to ON.
11. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 255. Measure and record the Accelerometer temperature voltage as indicated on the JYM.
12. Set the CROSSBAR CONTROL to 156. Measure and record the IRIG temperature voltage.
13. Allow 30 minutes warm up for the GSE.
- RESET/CONTROL FAIL on the Monitor panel

VERIFICATION WITH SIDL REQUIRED BEFORE USE  
DATE 15 MAR 66

- r. Programmer and Monitor panel - Press the MONITOR MODE CONTROL pushbutton. The pushbutton shall light. Press the VERIFY FAIL RESET pushbutton if the VERIFY FAIL lamp is lighted. The VERIFY FAIL lamp shall go out.
- ROTARY TABLE POSITIONING
16. Obtain and record  $\phi_{21}$  and  $\phi_{22}$  (Tilt angle readout + indicator error) from JDC 16011.
17. Obtain and record  $\epsilon_{cy}$  from the Mounting Fixture calibration decal.
18. Obtain and record  $\epsilon_{TD}$  (average rotary table tilt axis error) from the Calibration Chart in Section II of the Data Sheets of JDC 19728 for a rotary angle of  $90^\circ$ .
19. Calculate the calibrated tilt axis Position 1 angle ( $\phi$ ).
- $$\phi_1 = \frac{\phi_{21} + \phi_{22}}{2} + 90^\circ - \epsilon_{TD} 90^\circ - \epsilon_{cy}$$
20. Calculate the calibrated tilt axis Position 2 angle ( $\phi$ ).
- $$\phi_2 = \frac{\phi_{21} + \phi_{22}}{2} - \epsilon_{cy}$$
21. Obtain and record  $\theta_{31}$  and  $\theta_{32}$  (Rotary angle readout + indicator error) from JDC 16012.
22. Obtain and record  $\epsilon_{CZ}$  from the Mounting Fixture calibration decal.
23. Obtain and record  $\epsilon_{TC} 150^\circ$  (Average rotary table rotary axis error) from Section I of the Data Sheets of JDC 19728 for a rotary angle of  $150^\circ$ .

24. Calculate the calibrated rotary axis position  $\theta$ .
- $$\theta = \frac{\theta_{31} + \theta_{32}}{2} - \epsilon_{TC} 150^\circ + \epsilon_{CZ}$$
- NOTE: If calculated  $\theta$  results in an angle approximately  $330^\circ$ , subtract  $180^\circ$  from the calculated value.
25. Set the Rotary table axis to the angles calculated in steps 19 and 24.
- NOTE: The IMU nameplate should be on the floor-side after performing step 23.

- h. Frequency Counter panel - FUNCTION to TIME A  $\rightarrow$  B FREQ-TIME to SEC POWER to ON GATE to AUTO TRIGGER LEVEL to Any Position INPUT VOLTS RMS to any position
- i. Power Control panel - VOLTAGE SELECT to AGC-OFF RANGE SELECT to 1000V AGC VOLTAGE switches to OFF STATION to ON TEST SET to ON ACVM to ON
- j. Oscilloscope panel SCALE ILLUM - Any position but OFF k. XY Interface panel SCOPE to OFF FREQ + PHASE to OFF OUT  $\rightarrow$  IN to OFF Y MARGINS to NORM
- l. RDC Interface panel - CHAN V METERS to OFF DE MARGINS to NORM All others fully CCW
- m. Tape Recorder panel - ON/OFF to OFF
- n. Self Test panel - none
- o. Power Supply 3 VDC panel - All switches to ON
- INDICATOR SELECTOR switch to VOLTAGE REGULATED
- p. AC Input panel (Back of Console) STA POWER to ON AUX OUTLETS to OFF
- q. XY Interface panel - Press the DL ENABLE and WORD RATE 50 PPS pushbuttons. The pushbuttons shall light.
- DATE 15 MAR 66

JOB GROUND SUPPORT EQUIPMENT TURNON

ASSEMBLY UNDER TEST		TEST HISTORY				
TITLE	DATE	START	END	SITE / LOCATION		
SER. NO.	DWG	REV.	TIME	TOTAL ELAPSED		
MAJOR GROUND SUPPORT EQUIPMENT						
NAME SER. NO. CAL DATE						
NAME SER. NO. CAL DATE						
CONDUCTED BY NAME/AFFILIATION APPROVED BY NAME/AFFILIATION						
JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ ACC
11	Accel. Temp	VDC	-2.5		+2.5	
12	IRIG Temp	VDC	-3.25		+4.0	
14.a	115V, 60 cps $\phi$ A	VAC	105		125	
14.b	115V, 60 cps $\phi$ B	VAC	105		125	
14.c	115V, 60 cps $\phi$ C	VAC	105		125	
14.d	27 VDC	VDC	25		29	
14.e	28 VDC	VDC	26		31	
14.f	+30 VDC GSE	VDC	28		32	
14.g	-30 VDC GSE	VDC	-28		-32	
14.h	115V, 400 cps	VAC	112.5		117.5	
16	$\phi_{21}$	Deg.				
	$\phi_{22}$	Deg.				
17	$\epsilon_{cy}$	Deg.				
18	$\epsilon_{TD}$	Deg.				

DATE 15 MAR 66

DATE 15 MAR 66



SUBSYSTEM LEM G & N SYSTEM  
DESCRIPTION Turnon ground support equipment for G & N System Test including Rotary and Tilt Axis calibrated angle determination and positioning.

Rev. Let.	Date	TDRR NO.	PAGES REVISED	APPROVAL	REFERENCES
1	4-13-66	28075	2	MIT NAS	PS 6015000
2	5-25-66	29175	2, 3	WK ACME	
3	6-16-66	29679	3	MM ACME	
4	8-4-66	30516	3	EA	
5	12-15-66	32342	2, 3	EA	
					IMPORTANT Steps 2 thru 5 must be performed in less than 15 minutes
					INTERVAL
					TOOLS AND MATERIAL

#### PROCEDURE

If the Temperature Monitor Control is indicating any temperature failure.

1. Set the PRIME POWER CIRCUIT BREAKER on the back of the OIA and Oscillograph Console to ON.
2. Set the PTC POWER switch to OFF.
3. Remove the PTC power cable connector P2 from IMU connector 55A1J1.
4. Connect "B" Harness connector 56P21 to IMU connector 55A1J1.
5. Connect W120 connector P2 to "B" Harness connector 56J1.
6. Insure that the SENSOR selector on the Temperature Monitor Control panel is in the IMU position.
7. Reset the TEMP CONTROL PUSH RESET/CONTROL FAIL on the Monitor panel.

VERIFICATION WITH SID REQUIRED BEFORE USE

DATE 15 MAR 66

FORM 00143  
Chg. 7-23-65

1. Programmer and Monitor panel - Press the MONITOR MODE CONTROL pushbutton. The pushbutton shall light. Press the VERIFY FAIL RESET pushbutton if the VERIFY FAIL lamp is lighted. The VERIFY FAIL lamp shall go out. Press ALARM RESET pushbutton to turn off alarms.
2. ROTARY TABLE POSITIONING
3. Obtain and record  $\phi_{21}$  and  $\phi_{22}$  (Tilt angle readout + indicator error) from JDC 16011.
4. Obtain and record  $\epsilon_{cy}$  from the Mounting Fixture calibration decal.
5. Obtain and record  $\epsilon_{TD}$  (average rotary table tilt axis error) from the Calibration Chart in Section II of the Data Sheets of JDC 19728 for a rotary angle of  $90^\circ$ .
6. Calculate the calibrated tilt axis Position 1 angle ( $\phi_1$ ).
7. Calculate the calibrated tilt axis Position 2 angle ( $\phi_2$ ).
8. Obtain and record  $\phi_{31}$  and  $\phi_{32}$  (Rotary angle readout + indicator error) from JDC 16012.
9. Obtain and record  $\epsilon_{cy}$  from the Mounting Fixture calibration decal.
10. Obtain and record  $\epsilon_{TD}$  (Average rotary table rotary axis error) from Section I of the Data Sheets of JDC 19728 for a rotary angle of  $150^\circ$ .

NOTE: The IMU nameplate should be on the floor-side after performing step 23.

TITLE		DATE		END		SITE / LOCATION	
SER. NO.	DWG	REV.	TIME	START	END	TOTAL ELAPSED	
MJOR GROUND SUPPORT EQUIPMENT							
NAME		SER. NO.		CAL DATE			
NAME		SER. NO.		CAL DATE			
CONDUCTED BY NAME/AFFILIATION APPROVED BY NAME/AFFILIATION							

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ ACC
11	Accel. Temp	VDC	-2.5		+2.5	
12	IRIG Temp	VDC	-3.25		+4.0	
14.a	115V, 60 cps $\phi$ A	VAC	105		125	
14.b	115V, 60 cps $\phi$ B	VAC	105		125	
14.c	115V, 60 cps $\phi$ C	VAC	105		125	
14.d	27 VDC	VDC	25		29	
14.e	28 VDC	VDC	26		31	
14.f	+30 VDC GSE	VDC	28		32	
14.g	-30 VDC GSE	VDC	-28		-32	
14.h	115V, 400 cps	VAC	112.5		117.5	
16	$\phi_{21}$	Deg.				
	$\phi_{22}$	Deg.				
17	$\epsilon_{cy}$	Deg.				
18	$\epsilon_{TD}$	Deg.				

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FORM 00144  
Chg. 7-23-65

SUBSYSTEM LEM G & N SYSTEM

OIA VOLTAGE MEASUREMENT

14. Measure the following voltages on the DVM by setting the CROSSBAR CONTROL on the Primary Signal Selector panel as indicated:

Voltage	CROSSBAR CONTROL
a. 115V 60 cps GSE $\phi$ A	279
b. 115V 60 cps GSE $\phi$ B	180
c. 115V 60 cps GSE $\phi$ C	280
d. 27VDC GSE Relay Power	179
e. 28VDC Var Buss Remote Sense	171
f. +30VDC GSE Electronics	170
g. -30VDC GSE Electronics	270
h. 115V 400 cps	177

#### COMPUTER TEST SET SWITCHES

15. Set switches on the Computer Test Set as follows:

- a. Power Control panel - All switches set to OFF
- b. RANGE SELECT to 1000V
- c. ACVM range switch to 500V
- d. AC Input panel - STA POWER to OFF.
- e. Tape Perforator panel - ON/OFF to OFF.
- f. Logic Drawer No. 1 - All switches fully CCW.
- g. Logic Drawer No. 2 - All switches to OFF.
- h. Programmer And Monitor panel - REGISTER SELECT to OFF
- i. TEST MODE to SYSTEM
- j. MODE CONTROL to Any Position
- k. Press ALARM RESET pushbutton to turn off alarms.
- l. Power Supply panel - All switches to ON position.

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SUBSYSTEM LEM G & N SYSTEM  
DESCRIPTION Turnon ground support equipment for G & N System Test including Rotary and Tilt Axis calibrated angle determination and positioning.

Rev.	Date	TDRR NO.	PAGES REVISED	APPROVAL	REFERENCES
1	A 414-66	28075	2	MIT NAS	FS 6015000
2	B 5-25-66	29175	2, 3	WK ACN	
3	C 6-16-66	29679	3	MM ACN	
4	D 8-4-66	30516	3	EA	
5	E 12-15-66	32342	2, 3	EA	
					INTERVAL
					TOOLS AND MATERIAL

PROCEDURE  
If the Temperature Monitor Control is indicating any temperature failure.

1. Set the PRIME POWER CIRCUIT BREAKER on the back of the OIA and Oscillograph Console to ON.
2. Set the PTC POWER switch to OFF.
3. Remove the PTC power cable connector P2 from IMU connector 35A1J1.
4. Connect "B" Harness connector 56P21 to IMU connector 35A1J1.
5. Connect W120 connector P2 to "B" Harness connector 56J1.
6. Insure that the SENSOR selector on the Temperature Monitor Control panel is in the IMU position.
7. Reset the TEMP CONTROL PUSH RESET/CONTROL FAIL on the Monitor panel.

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SUBSYSTEM LEM G & N SYSTEM

r. Programmer and Monitor panel - Press the MONITOR MODE CONTROL pushbutton. The pushbutton shall light. Press the VERIFY FAIL RESET pushbutton if the VERIFY FAIL lamp is lighted. The VERIFY FAIL lamp shall go out. Press ALARM RESET pushbutton to turn off alarms.

16. Obtain and record  $\theta_{21}$  and  $\theta_{22}$  (Tilt angle readout + indicator error) from JDC 16011.

17. Obtain and record  $\epsilon_{cy}$  from the Mounting Fixture calibration decal.

18. Obtain and record  $\epsilon_{TD}$  (average rotary table tilt axis error) from the Calibration Chart in Section II of the Data Sheets of JDC 19728 for a rotary angle of 90°.

19. Calculate the calibrated tilt axis Position 1 angle ( $\phi$ ).

Position 1 angle ( $\phi$ ).

20. Calculate the calibrated tilt axis Position 2 angle ( $\phi$ ).

21. Obtain and record  $\theta_{31}$  and  $\theta_{32}$  (Rotary angle readout + indicator error) from JDC 16012.

22. Obtain and record  $\epsilon_{CZ}$  from the Mounting Fixture calibration decal.

23. Obtain and record  $\epsilon_{TC}$  150° (Average rotary table rotary axis error) from Section I of the Data Sheets of JDC 19728 for a rotary angle of 150°.

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SUBSYSTEM LEM G & N SYSTEM

h. Frequency Counter panel - FUNCTION to TIME A → B  
FREQ-TIME to SEC  
POWER to ON  
GATE to AUTO  
TRIGGER LEVEL to Any Position  
INPUT VOLTS RMS to any position

1. Power Control panel - VOLTAGE SELECT to AGC-OFF  
RANGE SELECT to 1000V  
AGC VOLTAGE switches to OFF  
STATION to ON  
TEST SET to ON
2. ACVM to ON
3. Oscilloscope panel
4. SCALE ILLUM - Any position but OFF
5. XY Interface panel
6. SCOPE to OFF
7. FREQ + PHASE to OFF
8. OUT → IN to OFF
9. Y MARGINS to NORM
10. RDC Interface panel - CHAN V METERS to OFF  
DE MARGINS to NORM  
All others fully CCW
11. Tape Recorder panel - ON/OFF to OFF
12. Self Test panel - none
13. Power Supply 3 VDC panel - All switches to ON
14. INDICATOR SELECTOR switch to VOLTAGE REGULATED
15. STA POWER to ON
16. AUX OUTLETS to OFF
17. q. XY Interface panel - Press the DL ENABLE and WORD RATE 50 PPS pushbuttons. The pushbuttons shall light.

14. Measure the following voltages on the DVM by setting the CROSSBAR CONTROL on the Primary Signal Selector panel as indicated:

Voltage

CROSSBAR CONTROL

a. 115V 60 cps GSE  $\phi$ A 279

b. 115V 60 cps GSE  $\phi$ B 180

c. 115V 60 cps GSE  $\phi$ C 280

d. 27VDC GSE Relay Power 179

e. 28VDC Var Bus Remote 171

f. +30VDC GSE Electronics 170

g. -30VDC GSE Electronics 270

h. 115V 400 cps 177

15. Set switches on the Computer Test Set as follows:

a. Power Control panel - All switches set to OFF  
RANGE SELECT to 1000V  
ACVM range switch to 500V

b. AC Input panel - STA POWER to OFF.

c. Tape Recorder panel - ON/OFF to OFF.

d. Logic Drawer No. 1 - All switches fully CCW.

e. Logic Drawer No. 2 - All switches to OFF.

f. Programmer And Monitor panel - REGISTER SELECT to OFF  
TEST MODE to SYSTEM  
MODE CONTROL to Any Position

Press ALARM RESET pushbutton to turn off alarm.

g. Power Supply panel - All switches to ON position.

APOLLO 6&N

EQUIPMENT TEST

DATA SHEET 1 OF 3

JOB GROUND SUPPORT EQUIPMENT TURNON

TEST HISTORY		DATE		TIME		END		SITE / LOCATION		TOTAL ELAPSED	
SER. NO.	DWG	REV.	SER. NO.	SER. NO.	SER. NO.	SER. NO.	SER. NO.	SER. NO.	SER. NO.	SER. NO.	SER. NO.
MAJOR GROUND SUPPORT EQUIPMENT											
CONDUCTED BY: NAME/AFFILIATION: APPROVED BY: NAME/AFFILIATION:											
JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ ACC					
11	Accel. Temp	VDC	-2.5		+2.5						
12	IRIG Temp	VDC	-3.25		+4.0						
14.a	115V, 60 cps $\phi$ A	VAC	105		125						
14.b	115V, 60 cps $\phi$ B	VAC	105		125						
14.c	115V, 60 cps $\phi$ C	VAC	105		125						
14.d	27 VDC	VDC	25		29						
14.e	28 VDC	VDC	26		31						
14.f	+30 VDC GSE	VDC	28		32						
14.g	-30 VDC GSE	VDC	-28		-32						
14.h	115V, 400 cps	VAC	112.5		117.5						
16	$\phi_{21}$	Deg.									
17	$\phi_{22}$	Deg.									
18	$\epsilon_{cy}$	Deg.									
18	$\epsilon_{TD}$	Deg.									

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FORM 00146  
Chg. 7-23-65



JDC  
NO. 12012  
REV. 3

JDC  
NO. 12612  
REV. E

**JOB GROUND SUPPORT EQUIPMENT TURNON**

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ ACC
19	$\phi_1$	Deg.		° ' "		
20	$\phi_2$	Deg.		° ' "		
21	$\theta_{31}$	Deg.		° ' "		
	$\theta_{32}$	Deg.		° ' "		
22	$\epsilon_{CZ}$	Deg.		° ' "		
23	$\epsilon_{TC} 150^\circ$	Deg.		° ' "		
24	$\theta$	Deg.		° ' "		

DATE 15 MAR 66

FORM 00147  
Ch.: 7-23-65

FORM 101-18  
Chg. 7-23-65



Rev	Let	Date	TDRR NO.	PAGES REVISED	APPROVAL	REFERENCES
1	A	11-1-66	28975	2	MIT NAS	PS 6015000
2	B	11-1-66	28975	2,3	WK ACN	
3	C	11-1-66	28975	3	MM ACN	
4	D	11-1-66	30516	3	MM ACN	
5	E	11-1-66	32342	2,3	EA ACN	
6	F	11-1-66	35186	2	EA ACN	

PROCEDURE

If the Temperature Monitor Control is indicating any temperature failure.

TEMPERATURE CONTROL SWITCHOVER

1. Set the PRIME POWER CIRCUIT BREAKER on the back of the OIA and Oscillograph Console to ON.

2. Set the PTC POWER switch to OFF.

3. Remove the PTC power cable connector P2 from IMU connector 35A1J1.

4. Connect "B" Harness connector 56P21 to IMU connector 35A1J1.

5. Connect W120 connector P2 to "B" Harness connector 56J1.

6. Insure that the SENSOR selector on the Temperature Monitor Control panel is in the IMU position.

7. Reset the TEMP CONTROL PUSH RESET/CONTROL FAIL on the Monitor panel.

VERIFICATION WITH SCL REQUIRED BEFORE USE

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FCR 4 0143  
Chg: 7-3-66

SUBSYSTEM LEM G & N SYSTEM

OIA VOLTAGE MEASUREMENT

14. Measure the following voltages on the DVM by setting the CROSSBAR CONTROL on the Primary Signal Selector panel as indicated:

Voltage

CROSSBAR CONTROL

a. 115V 60 cps GSE  $\phi$ A 279

b. 115V 60 cps GSE  $\phi$ B 180

c. 115V 60 cps GSE  $\phi$ C 280

d. 27VDC GSE Relay Power 179

e. 28VDC Var Bias Remote Sense 171

f. +30VDC GSE Electronics 170

g. -30VDC GSE Electronics 270

h. 115V 400 cps 177

15. Set switches on the Computer Test Set as follows:

a. Power Control panel - All switches set to OFF

RANGE SELECT to 1000V

ACVM range switch to 500V

b. AC Input panel - STA POWER to OFF.

c. Tape Recorder panel - ON/OFF to OFF.

d. Logic Drawer No. 1 - All switches fully CCW.

e. Logic Drawer No. 2 - All switches to OFF.

f. Programmer And Monitor panel - REGISTER SELECT to OFF

TEST MODE to SYSTEM

MODE CONTROL to Any Position

Press ALARM RESET pushbutton to turn off alarms.

g. Power Supply panel - All switches to ON position.

h. Frequency Counter panel - FUNCTION to TIME A  $\rightarrow$  B

FREQ-TIME to SEC

POWER to ON

GATE to AUTO

TRIGGER LEVEL to Any Position

INPUT VOLTS RMS to any position

i. Power Control panel - STATION to ON

TEST SET to ON

ACVM to ON

j. Oscilloscope panel - SCALE ILLUM - Any position but OFF

k. XY Interface panel - SCOPE to OFF

FREQ + PHASE to OFF

OUT  $\rightarrow$  IN to OFF

Y MARGINS to NORM

l. RDC Interface panel - CHV METERS to OFF

DE MARGINS to NORM

All other switches fully CCW

m. Tape Recorder panel - ON/OFF to OFF

n. Self Test panel - none

o. Power Supply 3 VDC panel - All switches to ON

INDICATOR SELECTOR switch to VOLTAGE REGULATED

p. AC Input panel (Back of Console) STA POWER to ON

AUX OUTLETS to OFF

q. XY Interface panel - Press the DL ENABLE and WORD RATE 50 PPS pushbuttons. The pushbuttons shall light.

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SUBSYSTEM LEM G & N SYSTEM

r. Programmer and Monitor panel - Press the MONITOR MODE CONTROL pushbutton. The pushbutton shall light. Press the VERIFY FAIL RESET pushbutton if the VERIFY FAIL lamp is lighted. The VERIFY FAIL lamp shall go out. Press ALARM RESET pushbutton to turn off alarms.

ROTARY TABLE POSITIONING

16. Obtain and record  $\phi_{21}$  and  $\phi_{22}$  (Tilt angle readout + indicator error) from JDC 16011.

17. Obtain and record  $\epsilon_{cy}$  from the Mounting Fixture calibration decal.

18. Obtain and record  $\epsilon_{TD}$  (average rotary table tilt axis error) from the Calibration Chart in Section II of the Data Sheets of JDC 19728 for a rotary angle of 90°.

19. Calculate the calibrated tilt axis Position 1 angle ( $\theta$ ).

$$\theta_1 = \frac{\phi_{21} + \phi_{22}}{2} + 90^\circ - \epsilon_{TD} - \epsilon_{cy}$$

20. Calculate the calibrated tilt axis Position 2 angle ( $\theta$ ).

$$\theta_2 = \frac{\phi_{21} + \phi_{22}}{2} - \epsilon_{cy}$$

21. Obtain and record  $\theta_{31}$  and  $\theta_{32}$  (Rotary angle readout + indicator error) from JDC 16012.

22. Obtain and record  $\epsilon_{CZ}$  from the Mounting Fixture calibration decal.

23. Obtain and record  $\epsilon_{TC}$  150° (Average rotary table rotary axis error) from Section I of the Data Sheets of JDC 19728 for a rotary angle of 150°.

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JOB GROUND SUPPORT EQUIPMENT TURNON

ASSEMBLY UNDER TEST				TEST HISTORY			
TITLE	SER. NO.	DWG	REV.	DATE	START	END	SITE / LOCATION
MAJOR GROUND SUPPORT EQUIPMENT				TIME	START	END	TOTAL ELAPSED
NAME	SER. NO.	NAME	SER. NO.	NAME	SER. NO.	NAME	SER. NO.
CONDUCTED BY				APPROVED BY			
JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
11	Accel. Temp	VDC	-2.5		+2.5		
12	IRIG Temp	VDC	-3.25		+4.0		
14.a	115V, 60 cps $\phi$ A	VAC	105		125		
14.b	115V, 60 cps $\phi$ B	VAC	105		125		
14.c	115V, 60 cps $\phi$ C	VAC	105		125		
14.d	27 VDC	VDC	25		29		
14.e	28 VDC	VDC	26		31		
14.f	+30 VDC GSE	VDC	28		32		
14.g	-30 VDC GSE	VDC	-28		-32		
14.h	115V, 400 cps	VAC	112.5		117.5		
16	$\phi_{21}$	Deg.					
	$\phi_{22}$	Deg.					
17	$\epsilon_{cy}$	Deg.					
18	$\epsilon_{TD}$	Deg.					

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FORM 101-16  
CIR. 7-15-65



SUBSYSTEM LEM G & N SYSTEM  
 DESCRIPTION Turnon ground support equipment for G & N System Test including Rotary and Tilt Axis calibrated angle determination and positioning.

ASSY

Rev.	Date	TDRR NO.	PAGES REVISED	APPROVAL	REFERENCES
A	14-1-66	28075	2	MIT	PS 6015000
B	25-4-66	29175	2, 3	WK	ACM
C	16-1-66	29679	3	MM	ACM
D	18-4-66	30516	3	EA	
E	12-1-66	32342	2, 3	EA	
F	11-9-67	35186	2	EA	
G	22-68	35931	1, 2	EA	
					TOOLS AND MATERIAL

# PROCEDURE

## TEMPERATURE CONTROL SWITCHOVER

1. Set the PRIME POWER CIRCUIT BREAKER on the back of the OIA and Oscillograph Console to ON.

2. Set the PTC POWER switch to OFF.

3. Remove the PTC power cable connector P2 from IMU connector 35A1J1.

NOTE: When mating a microdot plug to a receptacle, observe the following procedures to avoid possible damage to the connectors. Microdot connectors have a locking action which is opposite to that of most electrical connectors; that is, the locking ring is NOT free to rotate when the plug and receptacle

are NOT engaged.

1. Inspect the plug to make sure that the scribe mark next to the word ENGAGE on the locking ring is aligned with the scribe mark on the main body of the connector. Use light finger pressure to assure that the ring does NOT freely rotate from ENGAGE to LOCK position. 2. With the connector aligned to the receptacle along the insertion axis, as indicated by position lines, and with side forces relieved (which may require grasping harness with free hand), hold locking ring of plug between thumb and forefinger. Press into receptacle. When the connectors

VERIFICATION WITH SID REQUIRED BEFORE USE

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SUBSYSTEM LEM G & N SYSTEM

ASSY

are fully engaged, an audible click will be heard.

3. Check rotation by grasping locking ring between thumb and forefinger and exerting a moderate pull force. If the connectors disengage, improper mating is indicated.

4. Use fingertip pressure to rotate the locking ring from ENGAGE to LOCK position when the connectors are fully mated. Check locking action by exerting a light pull on the connector.

When disengaging microdot connectors, observe the following procedures to avoid damage to the plug or receptacle.

5. Grasp locking ring and rotate from LOCK to ENGAGE position (scribe mark next to word LOCK on locking ring aligned with scribe mark on main body of connector.) CAUTION: Always use disengagement tool specified in following step. Manual disengagement may damage connector.

6. Insert the finger part of special tool FA 75702-007 between the facing surfaces of the plug and receptacle. Insert tool to full engagement position for maximum

leverage. Grasp tool handle and rotate in an arc about the axis perpendicular to the connector axis to disengage connectors.

4. Connect "B" Harness connector 56P21 to IMU connector 35A1J1.

5. Connect W120 connector P2 to "B" Harness connector 56J1.

6. Insure that the SENSOR selector on the Temperature Monitor Control panel is in the IMU position.

7. Reset the TEMP CONTROL PUSH RESET/CONTROL FAIL on the Monitor panel if the Temperature Monitor Control is indicating any temperature failure.

8. The AUX HTR PWR lamp on the Temperature Monitor Control panel shall be lighted.

9. Press the OIA ON pushbutton on the Test Control panel.

10. Set the POWER switch on the Digital Voltmeter panel to ON.

11. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 255.

Measure and record the Accelerometer temperature voltage as indicated on the DVM.

12. Set the CROSSBAR CONTROL to 156. Measure and record the IRIG temperature voltage.

13. Allow 30 minutes warm up for the GSE.

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SUBSYSTEM LEM G & N SYSTEM

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## OIA VOLTAGE MEASUREMENT

14. Measure the following voltages on the DVM by setting the CROSSBAR CONTROL on the Primary Signal Selector panel as indicated:

Voltage	CROSSBAR CONTROL
a. 115V 60 cps GSE $\phi$ A	279
b. 115V 60 cps GSE $\phi$ B	180
c. 115V 60 cps GSE $\phi$ C	280
d. 27VDC GSE Relay Power	179
e. 28VDC Var Bus Remote Sense	171
f. +30VDC GSE Electronics	170
g. -30VDC GSE Electronics	270
h. 115V 400 cps	177

## COMPUTER TEST SET SWITCHES

15. Set switches on the Computer Test

Set as follows:

a. Power Control panel -

All switches set to OFF

RANGE SELECT to 1000V

ACVM range switch to 500V

b. AC Input panel - STA POWER to OFF.

c. Tape Perforator panel - ON/OFF to OFF.

d. Logic Drawer No. 1 - All switches fully CCW.

e. Logic Drawer No. 2 - All switches to OFF.

f. Programmer And Monitor panel -

REGISTER SELECT to OFF

TEST MODE to SYSTEM

MODE CONTROL to Any Position

g. Power Supply panel - All switches to ON position.

h. Frequency Counter panel -

FUNCTION to TIME A  $\rightarrow$  B

FREQ-TIME to SEC

POWER to ON

GATE to AUTO

TRIGGER LEVEL to Any Position

INPUT VOLTS RMS to any position

i. AC Input panel (Back of Console)

STA POWER to ON

AUX OUTLETS to OFF

j. Oscilloscope panel

SCALE ILLUM - Any position but OFF

k. XY Interface panel

SCOPE to OFF

FREQ + PHASE to OFF

OUT  $\rightarrow$  IN to OFF

Y MARGINS to NORM

l. RDC Interface panel -

CHV METERS to OFF

DE MARGINS to NORM

All other switches fully CCW

m. Tape Recorder panel - ON/OFF to OFF

n. Self Test panel - none

o. Power Supply 3 VDC panel -

All switches to ON

INDICATOR SELECTOR switch to

VOLTAGE REGULATED

p. Power Control panel -

STATION to ON

TEST SET to ON

ACVM to ON

q. XY Interface panel - Press the DL ENABLE

and WORD RATE 50 PPS pushbuttons. The

pushbuttons shall light. DATE 15 MAR 66

SUBSYSTEM LEM G & N SYSTEM

ASSY

r. Programmer and Monitor panel - Press the MONITOR MODE CONTROL pushbutton. The pushbutton shall light. Press the VERIFY FAIL RESET pushbutton if the VERIFY FAIL lamp is lighted. The VERIFY FAIL lamp shall go out. Press ALARM RESET pushbutton to turn off alarms.

ROTARY TABLE POSITIONING

16. Obtain and record  $\phi_{21}$  and  $\phi_{22}$  (Tilt angle readout + indicator error) from JDC 16011.

17. Obtain and record  $\epsilon_{cy}$  from the Mounting Fixture calibration decal.

18. Obtain and record  $\epsilon_{TD}$  (average rotary table tilt axis error) from the Calibration Chart in Section II of the Data Sheets of JDC 19728 for a rotary angle of 90°.

19. Calculate the calibrated tilt axis Position 1 angle ( $\phi$ ).

$$\phi_1 = \frac{\phi_{21} + \phi_{22}}{2} + 90^\circ - \epsilon_{TD} 90^\circ - \epsilon_{cy}$$

20. Calculate the calibrated tilt axis Position 2 angle ( $\phi$ ).

$$\phi_2 = \frac{\phi_{21} + \phi_{22}}{2} - \epsilon_{cy}$$

21. Obtain and record  $\theta_{31}$  and  $\theta_{32}$  (Rotary angle readout + indicator error) from JDC 16012.

22. Obtain and record  $\epsilon_{CZ}$  from the Mounting Fixture calibration decal.

23. Obtain and record  $\epsilon_{TC} 150^\circ$  (Average rotary table rotary axis error) from Section I of the Data Sheets of JDC 19728 for a rotary angle of 150°.

24. Calculate the calibrated rotary axis position  $\theta$ .

$$\theta = \frac{\theta_{31} + \theta_{32}}{2} - \epsilon_{TC} 150^\circ + \epsilon_{CZ}$$

NOTE: If calculated  $\theta$  results in an angle approximately 330°, subtract 180° from the calculated value.

25. Set the Rotary table axis to the angles calculated in steps 19 and 24.

NOTE: The IMU nameplate should be on the floor-side after performing step 23.

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APOLLO G&N  
EQUIPMENT TEST  
DATA SHEET 1 OF 3

JDC  
NO. 12612  
REV. G  
INITIAL TDRR -

JOB GROUND SUPPORT EQUIPMENT TURNON

ASSEMBLY UNDER TEST				TEST HISTORY			
TITLE		DATE	START	END	SITE / LOCATION		
SER. NO.	DWG	REV.	TIME	START	END	TOTAL ELAPSED	
MAJOR GROUND SUPPORT EQUIPMENT							
NAME		SER. NO.		CAL DATE			
NAME		SER. NO.		CAL DATE			
CONDUCTED BY		NAME/AFFILIATION		APPROVED BY		NAME/AFFILIATION	

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ ACC
11	Accel. Temp	VDC	-2.5		+2.5	
12	IRIG Temp	VDC	-3.25		+4.0	
14.a	115V, 60 cps $\phi$ A	VAC	105		125	
14.b	115V, 60 cps $\phi$ B	VAC	105		125	
14.c	115V, 60 cps $\phi$ C	VAC	105		125	
14.d	27 VDC	VDC	25		29	
14.e	28 VDC	VDC	26		31	
14.f	+30 VDC GSE	VDC	28		32	
14.g	-30 VDC GSE	VDC	-28		-32	
14.h	115V, 400 cps	VAC	112.5		117.5	
16	$\phi$ 21	Deg.				
	$\phi$ 22	Deg.				
17	$\epsilon$ cy	Deg.				
18	$\epsilon$ TD	Deg.				

DATE 15 MAR 66

REVIEWED  
Cdr. T. J. Galt

APOLLO G&N  
EQUIPMENT TEST  
DATA SHEET 2 OF 3

JDC  
NO. 12612  
REV. G

JOB GROUND SUPPORT EQUIPMENT TURNON

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ ACC
19	$\phi$ 1	D-g.				
20	$\phi$ 2	D-g.				
21	$\phi$ 31	D-g.				
	$\phi$ 32	D-g.				
22	$\epsilon$ CZ	D-g.				
23	$\epsilon$ TC 150°	D-g.				
24	$\theta$	D-g.				

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APOLLO G&N  
EQUIPMENT TEST  
DATA SHEET 3 OF 3

JDC  
NO. 12612  
REV. G

JOB GROUND SUPPORT EQUIPMENT TURNON

JDC ITEM NO.	CALCULATIONS
19	$\phi_1 = \frac{\phi_{21} + \phi_{22}}{2} + 90^\circ - \epsilon_{TD} 90^\circ - \epsilon_{cy}$
20	$\phi_2 = \frac{\phi_{21} + \phi_{22}}{2} - \epsilon_{TD} 0^\circ - \epsilon_{cy}$
24	$\theta = \frac{\theta_{31} + \theta_{32}}{2} - \epsilon_{TC} 150^\circ + \epsilon_{CZ}$

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APOLLO G&N  
EQUIPMENT TEST  
DATA SHEET 1 OF 3

TDR 27134

MAR 15 1966

NO. 12612 DC  
REV. ---  
INITIAL T1/R1

JOB GROUND SUPPORT EQUIPMENT TURNON

ASSEMBLY UNDER TEST		TEST HISTORY	
TITLE	DATE	START	END
SER. NO.	DWG	REV.	SITE / LOCATION
MAJOR GROUND SUPPORT EQUIPMENT		START	END
		TOTAL ELAPSED	
NAME	SER. NO.	CAL DATE	
NAME	SER. NO.	CAL DATE	

CONDUCTED BY NAME/AFFILIATION APPROVED BY NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ ACC
11	Accel. Temp	VDC	-2.5		+2.5	
12	IRIG Temp	VDC	-3.25		+4.0	
14.a	115V, 60 cps $\phi$ A	VAC	105		125	
14.b	115V, 60 cps $\phi$ B	VAC	105		125	
14.c	115V, 60 cps $\phi$ C	VAC	105		125	
14.d	27 VDC	VDC	25		29	
14.e	28 VDC	VDC	26		31	
14.f	+30 VDC GSE	VDC	28		32	
14.g	-30 VDC GSE	VDC	-28		-32	
14.h	115V, 400 cps	VAC	112.5		117.5	
16	$\phi$ 21	Deg.				
	$\phi$ 22	Deg.				
17	$\epsilon$ oy	Deg.				
18	$\epsilon$ TD	Deg.				

DATE

FORM 0019  
Chg. 7-23-65

APOLLO G&N  
EQUIPMENT TEST  
DATA SHEET 3 OF 3

JOB GROUND SUPPORT EQUIPMENT TURNON

JDC ITEM NO.	CALCULATIONS
19	$\phi_1 = \frac{\phi_{21} + \phi_{22}}{2} + 90^\circ - \epsilon_{TD} 90^\circ - \epsilon_{oy}$
20	$\phi_2 = \frac{\phi_{21} + \phi_{22}}{2} - \epsilon_{TD} 0^\circ - \epsilon_{oy}$
24	$\theta = \frac{\theta_{31} + \theta_{32}}{2} - \epsilon_{TC} 180^\circ + \epsilon_{CZ}$

DATE

FORM 0019  
Chg. 7-23-65





DESCRIPTION It is necessary to establish an initial condition from which system operation can be performed. This procedure establishes the initial condition.

Rev. Let.	Date	TORR NO.	PAGES REVISED	APPROVAL	REFERENCES
A	6-7-66	28384	ALL	MIV. NASA	PS-6015000
B	7-6-66	30043	2	MMW. ACN	
				MMW.	IMPORTANT See below
					INTERVAL
					TOOLS AND MATERIAL

IMPORTANT: The G & N System must be handled, installed and operated with extreme care since it contains delicate, sensitive instruments and has many critical components. The proper setup procedure and operating sequence is required to prevent possible damage or degradation of G & N system and components. This JDC shall be complied with as specified to provide proper initial conditions before performing various tests.

1. Monitor the Monitor panel to insure that the LEM and G/N TEST CONFIG indicators are lighted.
2. Monitor the Temperature Monitor Control panel to insure the PSA HTR PWR indicator is lighted.
3. Monitor the Test Control panel to insure the following indicators are lighted:  
CGG/LGC POWER ON  
400 CPS POWER ON  
ISS OPERATE  
If any of the above indicators are not lit perform JDC 12614 (Turn On).
4. Monitor and insure that the ALARM INHIBIT pushbutton on the Monitor panel is not lighted.

VERIFICATION WITH SIDL REQUIRED BEFORE USE

5. Press the POWER ON pushbutton on the Primary Signal Selector panel, as necessary, to light the pushbutton.
6. Set the CROSSEBAR CONTROL on the Primary Signal Selector panel to 156. Insure that the DVM indicates less than  $\pm 2.5$  vdc.
7. Set the CROSSEBAR CONTROL to 255. Insure that the DVM indicates less than  $\pm 2.5$  vdc.
8. Press the ALARM TEST pushbutton on the Test Selector panel. The ALARM TEST pushbutton shall light.
9. Rotate the ALARM TEST selector through positions indicated under Alarm Fall list on OIA pull out drawer. At each position press the TEST START pushbutton. Observe that each lamp listed lights.
10. Set the CROSSEBAR CONTROL to 173.
11. Adjust the G & N POWER ADJUST control on the Test Control panel until the DVM indicates 28.0 ( $\pm 0.25$ ) vdc.
12. Insure that the STBY lamp on the DSKY is not lighted. If lighted, press and hold the STBY pushbutton until the lamp goes out.
13. Perform the following DSKY operations:
  - a. VERB 36 ENTR
  - b. Press RSET
  - c. VERB 41 NOUN 20 ENTR
  - d. Observe VERB 21 NOUN 22 Flashing
  - e. +00000 ENTR

- f. Observe VERB 22 NOUN 22 Flashing
- g. +00000 ENTR
- h. Observe VERB 23 NOUN 22 Flashing
- i. +00000 ENTR
- j. Observe VERB 41 NOUN 20 Displayed

SUBSYSTEM LEM G & N SYSTEM  
DESCRIPTION It is necessary to establish an initial condition from which system operation can be performed. This procedure establishes the initial condition.

Rev. Let.	Date	TORR NO.	PAGES REVISED	APPROVAL	REFERENCES
A	6-7-66	25384	All	MIV. NASA	PS-6015000
B	7-6-66	30343	2	MM. ACN	
C	8-4-66	30521	2	EA	IMPORTANT See below
					INTERVAL
					TOOLS AND MATERIAL

IMPORTANT: The G & N System must be handled, installed and operated with extreme care since it contains delicate, sensitive instruments and has many critical components. The proper setup procedure and operating sequence is required to prevent possible damage or degradation of G & N system and components. This JDC shall be complied with as specified to provide proper initial conditions before performing various tests.

1. Monitor the Monitor panel to insure that the LEM and G/N TEST CONFIG indicators are lighted.

2. Monitor the Temperature Monitor Control panel to insure the PSA HTR PWR Indicator is lighted.

3. Monitor the Test Control panel to insure the following indicators are lighted:  
CGC/LGC POWER ON  
400 CPS POWER ON  
ISS OPERATE  
If any of the above indicators are not lit perform JDC 12614 (Turn On).

4. Monitor and insure that the ALARM INHIBIT pushbutton on the Monitor panel is not lighted.

VERIFICATION WITH SIDL REQUIRED BEFORE USE  
DATE 15 MAR 66

ASSY	ASSY
5. Press the POWER ON pushbutton on the Primary Signal Selector panel, as necessary, to light the pushbutton.	f. Observe VERB 22 NOUN 22 Flashing ENTR
6. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 156. Insure that the DVM indicates less than $\pm 2.5$ vdc.	g. +00000
7. Set the CROSSBAR CONTROL to 255. Insure that the DVM indicates less than $\pm 2.5$ vdc.	h. Observe VERB 23 NOUN 22 Flashing ENTR
8. Press the ALARM TEST pushbutton on the Test Selector panel. The ALARM TEST pushbutton shall light.	i. +00000
9. Rotate the ALARM TEST selector through positions indicated under Alarm Fail list on OIA pull out drawer. At each position press the TEST START pushbutton. Observe that each lamp listed lights.	j. Observe VERB 41 NOUN 22 Displayed
10. Set the CROSSBAR CONTROL to 173.	
11. Adjust the G & N POWER ADJUST control on the Test Control panel until the DVM indicates 28.0 ( $\pm 0.25$ ) vdc.	
12. Insure that the STBY lamp on the DSKY is not lighted. If lighted, press and hold the STBY pushbutton until the lamp goes out.	
13. Perform the following DSKY operations: a. VERB 36 ENTR b. Press RSET c. VERB 41 NOUN 20 ENTR d. Observe VERB 21 NOUN 22 Flashing ENTR e. +00000	

DATE 15 MAR 66

DESCRIPTION It is necessary to establish an initial condition from which system operation can be performed. This procedure establishes the initial condition.

Rev.	Let	Date	TDRR NO.	PAGES REVISED	APPROVAL	REFERENCES
	A	6-7-66	28384	ALL	MIT, NASA	PS-6015000
	B	7-6-66	30043	2	MM, ACM	
	C	8-4-66	30521	2	MM, EA	IMPORTANT
	D	12-28-66	32470	2	EA	See below
						INTERVAL
						TOOLS AND MATERIAL

- IMPORTANT:** The G & N System must be handled, installed and operated with extreme care since it contains delicate, sensitive instruments and has many critical components. The proper setup procedure and operating sequence is required to prevent possible damage or degradation of G & N system and components. This JDC shall be complied with as specified to provide proper initial conditions before performing various tests.

1. Monitor the Monitor panel to insure that the LEM and G/N TEST CONFIG indicators are lighted.

2. Monitor the Temperature Monitor Control panel to insure the PSA HTR PWR indicator is lighted.

3. Monitor the Test Control panel to insure the following indicators are lighted:  
CGC/LGC POWER ON  
400 CPS POWER ON  
ISS OPERATE  
If any of the above indicators are not lit perform JDC 12614 (Turn On).

4. Monitor and insure that the ALARM INHIBIT pushbutton on the Monitor panel is not lighted.

5. Press the POWER ON pushbutton on the Primary Signal Selector panel, as necessary, to light the pushbutton.

6. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 156. Insure that the DVM indicates less than  $\pm 2.5$  vdc.

7. Set the CROSSBAR CONTROL to 255. Insure that the DVM indicates less than  $\pm 2.5$  vdc.

8. Press the ALARM TEST pushbutton on the Test Selector panel. The ALARM TEST pushbutton shall light.

9. Rotate the ALARM TEST selector through positions indicated under Alarm Fall list on OIA pull out drawer. At each position press the TEST START pushbutton. Observe that each lamp listed lights.

10. Set the CROSSBAR CONTROL to 173.

11. Adjust the G & N POWER ADJUST control on the Test Control panel until the DVM indicates 28.0 ( $\pm 0.25$ ) vdc.

12. Insure that the STBY lamp on the DSKY is not lighted. If lighted, press and hold the STBY pushbutton until the lamp goes out.

13. Perform the following DSKY operations:  
a. VERB 36 ENTR  
b. Press RSET  
c. VERB 40 NOUN 20 ENTR  
d. VERB 41 NOUN 20 ENTR  
e. Observe VERB 21 NOUN 22 Flashing
- f. +00000 Observe VERB 22 NOUN 22 Flashing ENTR

h. +00000 Observe VERB 23 NOUN 22 Flashing ENTR

k. Observe VERB 41 NOUN 22 Displayed

14. Press ALARM RESET pushbutton on the Programmer and Monitor panel of the CTS.

15. Perform the following DSKY operations:  
a. VERB 57 ENTR  
b. 00015 ENTR









SUBSYSTEM LEM G & N SYSTEM

DESCRIPTION It is necessary to establish an initial condition from which system operation can be performed. This procedure establishes the initial condition.

ASSY.

Rev. No.	Date	TDRR NO.	PAGES REVISED	APPROVAL	REFERENCES
A	6-7-66	28384	All	NAV INASA	PS-6015000
B	7-6-66	30043	2	NAV INASA	
C	8-4-66	30521	2	NAV INASA	IMPORTANT
D	12-28-66	32470	2	NAV INASA	See below
E	1-26-67	35300	All	NAV INASA	INTERVAL
F	9-1-67	35503	2	NAV INASA	
G	8-5-68	36627	2	NAV INASA	TOOLS AND MATERIAL
H	9-20-68	36843	2	NAV INASA	

IMPORTANT: 1. The G & N System must be handled, installed and operated with extreme care since it contains delicate, sensitive instruments and has many critical components. The proper setup procedure and operating sequence is required to prevent possible damage or degradation of G & N system and components. This JDC shall be complied with as specified to provide proper initial conditions before performing various tests.

2. During performance of any JDC do not allow VERB or NOUN to flash or any monitor display to remain lighted longer than necessary in order to prevent excessive cycling of DSKY relays. Perform the stop or steps required to extinguish the DSKY displays as soon as possible.

1. Monitor the Monitor panel to insure that the LEM and G/N TEST CONFIG indicators are lighted.

2. Monitor the Temperature Monitor Control panel to insure the PSA HTR PWR Indicator is lighted.

3. Monitor the Test Control panel to insure the following indicators are lighted:  
CGC/LGC POWER ON  
400 CPS POWER ON  
ESS OPERATE

If any of the above indicators are not lit perform JDC 12614 (Turn On).

4. Monitor and insure that the ALARM INHIBIT pushbutton on the Monitor panel is not lighted.

VERIFICATION WITH SIDL REQUIRED BEFORE USE

DATE 15 MAR 66

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Chg. 1-23-65

SUBSYSTEM LEM G & N SYSTEM

ASSY

5. Press the POWER ON pushbutton on the Primary Signal Selector panel, as necessary, to light the pushbutton.

6. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 156. Insure that the DVM indicates less than  $\pm 2.5$  vdc.

7. Set the CROSSBAR CONTROL to 155. Insure that the DVM indicates less than  $\pm 2.5$  vdc.

8. Set the CROSSBAR CONTROL to 173.

9. Adjust the G & N POWER ADJUST control on the Test Control panel until the DVM indicates 28.0 ( $\pm 0.25$ ) vdc.

10. Insure that the STBY lamp on the DSKY is not lighted. If lighted, press and hold PRO (or STBY) pushbutton until lamp goes out. If lamp does not go out within 5 seconds, release and press pushbutton again.

11. Perform the following DSKY operations:  
a. VERB 25 NOUN 01 ENTR  
b. Press RSET  
c. VERB 40 NOUN 20 ENTR  
Wait 5 seconds  
d. VERB 36 ENTR  
e. VERB 41 NOUN 20 ENTR  
f. Observe VERB 21 NOUN 23 Flashing

12. Press ALARM RESET pushbutton on the Programmer and Monitor panel of the CTS.

13. Perform the following DSKY operations:  
a. VERB 21 NOUN 01 ENTR  
b. 00370 ENTR  
c. 16002 ENTR  
14. Perform the following DSKY operations:  
a. VERB 25 NOUN 01 ENTR  
b. 03770 ENTR  
c. 10067 ENTR  
d. 04317 ENTR  
e. 01770 ENTR  
15. Perform the following DSKY operations:  
a. VERB 25 NOUN 26 ENTR  
b. 01000 ENTR  
c. 01770 ENTR  
d. 00007 ENTR  
e. VERB 30 ENTR  
f. Observe: COMP ACTY lamp is lighted.

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[illegible]

1. Monitor the Monitor panel to insure that the LEM and G/N TEST CONFIG indicators are lighted.
2. Monitor the Temperature Monitor Control panel to insure the AUX HTR PWR indicator or PSA HTR PWR indicator are lighted.
3. Monitor the Test Control panel to insure the following indicators are lighted:  
OIA PILOT POWER  
OIA DUCOSYN POWER ON
4. Monitor and insure that the ALARM INHIBIT pushbutton on the Monitor panel is not lighted.
5. Insure that the OIA ON pushbutton on the Test Control panel is lighted.

VERIFICATION WITH SIDL REQUIRED BEFORE USE

DATE \_\_\_\_\_

13. Set the CROSSBAR CONTROL to 171.
14. Adjust the G&N POWER ADJUST control on the Test Control until the DVM indicates 28.0 ( $\pm 0.25$ ) vdc.

7. Press the POWER ON pushbutton on the Primary Signal Selector panel, as necessary, to light the pushbutton.
8. Monitor the Test Control panel to determine that the following pushbuttons and indicators are lighted:  
ISS POWER DISABLED  
PROCEED

9. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 156. Insure that the DVM indicates less than  $\pm 2.5$  vdc.
10. Set the CROSSBAR CONTROL to 255. Insure that the DVM indicates less than  $\pm 2.5$  vdc.
11. Press the ALARM TEST pushbutton on the Test Selector Panel. The ALARM TEST pushbutton shall light.
12. Rotate the ALARM TEST selector through positions indicated under Alarm Fail list on OIA pull out drawer. Observe that each lamp listed lights.

DATE \_\_\_\_\_

SUBSYSTEM LEM G & N SYSTEM ASSY.  
DESCRIPTION Once the G & N System has been assembled and initial turn on has been performed, the G & N System will have to be turned on and off many times. This procedure shall be utilized as applicable.

Rev.	Date	TDOR NO.	PAGES REVISED	APPROVAL	REFERENCES
A	5-25-66	29176	All	JDC D.S. MIT NASA MMW ACM	PS-6015000
					IMPORTANT Inertial Component scale factor change may result if this procedure is not strictly adhered to.
					INTERVAL
					TOOLS AND MATERIAL

A. GENERAL G & N TURNON PROCEDURE

1. Turn on the OIA, Coolant and Power Console and CTS in accordance with applicable turnon procedures.

NOTE: Ascertain that all parameters are within listed tolerances.

2. Establish a Master Initialization Condition.

3. Press the CGC/ LGC POWER ON and the 400 CPS POWER ON pushbuttons on the Test Control panel. After the CGC/ LGC POWER ON, 400 CPS POWER ON and the PROCEED portion of the PROCEED/ ISS STANDBY

pushbuttons light, press the PROCEED/ ISS STANDBY pushbutton. The PSA HTR PWR pushbutton on the Temperature Monitor Control panel shall light. Record the time in the system log.

4. Insure that the STBY Condition lamp on the DSKY is not lighted. If it is, press and hold the STBY pushbutton until the lamp goes out.

5. Perform the following DSKY operations:

- a. VERB 36 ENTR
- b. RESET PRESS
- c. VERB 57 ENTR
- d. 00015 ENTR

VERIFICATION WITH SIDL REQUIRED BEFORE USE

DATE 15 MAR 66

10-110-113  
Chg. 1-2 (4-6)

SUBSYSTEM LEM G & N SYSTEM ASSY

NOTE: Allow 2 hours to elapse before proceeding to step 6 with the following exceptions:

- a. If the G & N System has been in the power off state for less than 5 days with the gimbals in the parked position (inner and Outer gimbal at 0° and Middle gimbal at 90°) and the system has not been moved, allow 90 seconds to elapse before proceeding.

- b. If the G & N System has been in the power off state for less than 15 minutes with the gimbals in the unparked position allow 90 seconds to elapse before proceeding.

- c. If the G & N System has been in the power off state with the gimbals in the unparked position for more than 15 minutes but less than 2 hours, allow a warmup time equal to the time off to elapse before proceeding.

- 6. Insure that the PROCEED portion of the PROCEED/ ISS OPERATE pushbutton is lighted and the Standby requirements have been met. Measure the PIPA temperature by setting the CROSSBAR CONTROL on the Primary Signal Selector panel to 255. When

the DVM indicates 0 (±0.75) vdc proceed to step 7.

- 7. Press the PROCEED/ ISS OPERATE pushbutton on the Test Control panel.

- 8. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 173 to measure the G & N 28 vdc on the DVM.

- 9. Adjust the G & N POWER ADJUST control on the Test Control panel until the DVM indicates 28.0 (±0.25) vdc.

B. GENERAL G & N SYSTEM - OIA DOWN

MODING FROM ISS OPERATE AND ANY

G & N MODE

- 1. Perform the following DSKY operations:

- a. VERB 41 NOUN 20 ENTR
- b. Observe VERB 21 NOUN 22 Flashing ENTR
- c. +00000
- d. Observe VERB 22 NOUN 22 Flashing ENTR
- e. +00000
- f. Observe VERB 23 NOUN 22 Flashing ENTR
- g. +09000

- 2. Press the PROCEED/ ISS STANDBY pushbutton on the Test Control panel. The PROCEED portion shall go out and the ISS STANDBY portion shall light.

NOTE: If a lower mode than ISS Standby is desired, proceed.

- 3. Press the OIA ON/ ISS POWER DISABLED pushbutton.

- 4. Press the CGC/ LGC POWER ON and the

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SUBSYSTEM LEM G & N SYSTEM ASSY

400 CPS POWER ON pushbuttons on the Test Control panel. The pushbuttons shall go out.

NOTE: If a lower mode than OIA ON is desired, proceed.

- 5. Press the POWER OFF pushbutton on the Test Control panel of the OIA or on the Emergency Shut Down panel of the Coolant Console. The OIA PILOT POWER lamp on the Test Control panel shall light. The AUX HTR PWR lamp on the Temperature Monitor Control panel shall light. Record the time off in the system log.

NOTE: If shutting down of the test station is desired, proceed to step 6.

- 6. Set the Main Power switch on the G & N Coolant and Power Console to OFF.

- 7. Set the TEST SET POWER and STATION POWER switches on the CTS to the OFF position.

- 8. Set the Rotary Table Tilt axis to approximately 0.00 degrees.

- 9. Set the Rotary Table Rotary axis to approximately 330.00 degrees.

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SUBSYSTEM LEM G & N SYSTEM ASSY  
DESCRIPTION Once the G & N System has been assembled and Initial turn on has been performed, the G & N System will have to be turned on and off many times. This procedure shall be utilized as applicable.

Rev.	Let.	Date	TORR NO.	PAGES REVISED	APPROVAL	REFERENCES
A	5-25-66	29176	ALL	-	MIT NASA	PS-6015000
B	7-5-66	30044	3	-	MM-2 ACMA	
C	10-20-68	31616	2,3	1	EA-1	IMPORTANT Inertial Component scale factor change may result if this procedure is not strictly adhered to.
						INTERVAL
						TOOLS AND MATERIAL

A. GENERAL G & N TURNON PROCEDURE  
1. Turn on the OIA, Coolant and Power Console and CTS in accordance with applicable turnon procedures.

NOTE: Ascertain that all parameters are within listed tolerances.

2. Establish a Master Initialization Condition.

3. Press the CGC/LGC POWER ON and the 400 CPS POWER ON pushbuttons on the Test Control panel. After the CGC/LGC POWER ON, 400 CPS POWER ON and the PROCEED portion of the PROCEED/ISS STANDBY

VERIFICATION WITH SIDL REQUIRED BEFORE USE DATE 15 MAR 68

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SUBSYSTEM LEM G & N SYSTEM ASSY

Record the indication of Row 1 and the time of day.

11. Perform the following DSKY operations:

VERB 21 NOUN 01 ENTR  
01300 ENTR

Row 1 Indication from step 10

12. Perform the following DSKY operations:

VERB 06 NOUN 02 ENTR  
01300 ENTR

Record the indication of Row 1.

13. Perform the calculations on the calculation sheet.

B. GENERAL G & N SYSTEM - OIA DOWN MODING FROM ISS OPERATE AND ANY G & N MODE

1. Perform the following DSKY operations:

a. VERB 41 NOUN 20 ENTR

b. Observe VERB 21 NOUN 22 Flashing

c. +00000 ENTR

d. Observe VERB 22 NOUN 22 Flashing

e. +00000 ENTR

f. Observe VERB 23 NOUN 22 Flashing

g. +09000 ENTR

2. Press the PROCEED/ISS STANDBY pushbutton on the Test Control panel. The PROCEED portion shall go out and the ISS STANDBY portion shall light.

DATE 15 MAR 68

FORM 00148  
Chg. 7-2 1-6,

SUBSYSTEM LEM G & N SYSTEM ASSY

NOTE: Allow 2 hours to elapse before proceeding to step 6 with the following exceptions:

a. If the G & N System has been in the power off state for less than 5 days with the gimbal in the parked position (Inner and Outer gimbal at 0° and Middle gimbal at 90°) and the system has not been moved, allow 90 seconds to elapse before proceeding.

b. If the G & N System has been in the power off state for less than 15 minutes with the gimbal in the unparked position allow 90 seconds to elapse before proceeding.

c. If the G & N System has been in the power off state with the gimbal in the unparked position for more than 15 minutes but less than 2 hours, allow a warmup time equal to the time off to elapse before proceeding.

6. Insure that the PROCEED portion of the PROCEED/ISS OPERATE pushbutton is lighted and the Standby requirements have been met. Measure the PIPA temperature by setting the CROSSBAR CONTROL on the Primary Signal Selector panel to 255. When the DVM indicates 0 (±0.75) vdc proceed to step 7.

7. Press the PROCEED/ISS OPERATE pushbutton on the Test Control panel.

8. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 173 to measure the G & N POWER ADJUST.

9. Adjust the G & N POWER ADJUST control on the Test Control panel until the DVM indicates 28.0 (±0.25) vdc.

NOTE: Steps 10 through 13 determine the time of day at which the high order scaler, Channel 3, will overflow.

Do not enter the PIPA and IRIG Tests (JDC 12617), the PIPA Scale Factor Tests (JDC 12624), or the PIPA Misalignment Tests (JDC 12625) within 0.2 hours of that time. If the high order scaler were to overflow during the performance of such tests, erroneous test results would occur. The high order scaler will overflow every 23.3 hours. If testing continues for more than one day without system turnoff, determine the time of scaler overflow for each day of testing.

10. Perform the following DSKY operations:

VERB 01 NOUN 10 ENTR

00003 ENTR

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APOLLO GAN EQUIPMENT TEST DATA SHEET 1 OF 1

JOB GENERAL TURNON AND TURNOFF PROCEDURES FOR THE G & N SYSTEM

ASSEMBLY UNDER TEST		TEST HISTORY	
TITLE	DATE	START	END
SER. NO.	DWG	REV.	SITE / LOCATION
MAJOR GROUND SUPPORT EQUIPMENT		TIME	TOTAL ELAPSED
NAME		SER. NO.	CAL DATE
NAME		SER. NO.	CAL DATE
CONDUCTED BY		APPROVED BY	
NAME/AFFILIATION		NAME/AFFILIATION	

JDC ITEM NUMBER	RECORDED VALUES AND CALCULATIONS
10	Row 1 indication =
	Time of day =
12	Row 1 indication =
13	Hours in high order scaler = line c X 5.12 = 3600 hours
	Time to overflow = 23.3 - line d = hours
	Time of overflow = line b + line e =

DATE

FORM 00146  
Chg. 7-23-65

GENERAL TURNON AND TURNOFF PROCEDURES FOR THE G & N SYSTEM

JDC 12614 REV. D PAGE 1 OF 3  
INITIAL TDRR 27134 DS.FGS

SUBSYSTEM LEM G & N SYSTEM

DESCRIPTION Once the G & N System has been assembled and initial turn on has been performed, the G & N System will have to be turned on and off many times. This procedure shall be utilized as applicable.

Rev. Let.	Date	TDRR NO.	PAGES REVISED	APPROVAL	REFERENCES
A	5-25-66	29176	JDC D.S.	MIT NASA	PS-6015000
B	7-5-66	30044	3	MMG JACM	
C	10-20-66	31616	2,3	MMG JACM	
D	12-28-66	32478	All	EA JP	IMPORTANT Inertial Component scale factor change may result if this procedure is not strictly adhered to.
					INTERVAL
					TOOLS AND MATERIAL

- A. GENERAL G & N TURNOFF PROCEDURE
- Turn on the OIA, Coolant and Power Console and CTS in accordance with applicable turnon procedures.  
NOTE: Ascertain that all parameters are within listed tolerances.
  - Establish a Master Initialization Condition.
  - Press the CGC/LGC POWER ON and the 400 CPS POWER ON pushbuttons on the Test Control panel. After the CGC/LGC POWER ON, 400 CPS POWER ON and the PROCEED portion of the PROCEED/ISS STANDBY pushbutton light, press the PROCEED/ISS STANDBY pushbutton. The PSA HTR PWR pushbutton on the Temperature Monitor Console shall light. Record the time in the system log.
  - Ensure that the STBY Condition lamp on the DSKY is not lighted. If it is, press and hold the STBY pushbutton until the lamp goes out.
  - Press the ALARM RESET pushbutton on the Programmer and Monitor panel of the CTS.
  - Perform the following DSKY operations:  
a. VERB 36 ENTR  
b. RESET PRESS  
c. VERB 57 ENTR  
d. 00015 ENTR

VERIFICATION WITH SIDL REQUIRED BEFORE USE  
DATE 15 MAR 66  
FORM 00146  
Chg. 7-23-65

GENERAL TURNON AND TURNOFF PROCEDURES FOR THE G & N SYSTEM

JDC 12614 REV. D PAGE 3 OF 3

SUBSYSTEM LEM G & N SYSTEM

Record the indication of Row 1 and the time of day.

- Perform the following DSKY operations:  
VERB 21 NOUN 01 ENTR  
01300 ENTR  
Row 1 Indication  
from step 10 ENTR
- Perform the following DSKY operations:  
VERB 06 NOUN 02 ENTR  
01300 ENTR  
Record the indication of Row 1.  
Perform the calculations on the calculation sheet.
- GENERAL G & N SYSTEM - OIA DOWN  
MODIFY FROM ISS OPERATE AND ANY G & N MODE

- Perform the following DSKY operations:  
a. VERB 41 NOUN 20 ENTR  
b. Observe  
VERB 21 NOUN 22 Flashing  
c. +00000 ENTR  
d. Observe  
VERB 22 NOUN 22 Flashing  
e. +00000 ENTR  
f. Observe  
VERB 23 NOUN 22 Flashing  
g. +09000 ENTR
- Press the PROCEED/ISS STANDBY pushbutton on the Test Control panel. The PROCEED portion shall go out and the ISS STANDBY portion shall light.

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GENERAL TURNON AND TURNOFF PROCEDURES FOR THE G & N SYSTEM

JDC 12614 REV. D PAGE 2 OF 3

SUBSYSTEM LEM G & N SYSTEM

ASSY

NOTE: Allow 2 hours to elapse before proceeding to step 6 with the following exceptions:

- If the G & N System has been in the power off state for less than 5 days with the gimbal in the parked position (inner and Outer gimbal at 0° and Middle gimbal at 90°) and the system has not been moved, allow 90 seconds to elapse before proceeding.
- If the G & N System has been in the power off state for less than 15 minutes with the gimbal in the unparked position allow 90 seconds to elapse before proceeding.
- If the G & N System has been in the power off state with the gimbal in the unparked position for more than 15 minutes but less than 2 hours, allow a warmup time equal to the time off to elapse before proceeding.

- Ensure that the PROCEED portion of the PROCEED/ISS OPERATE pushbutton is lighted and the Standby requirements have been met. Measure the PIPA temperature by setting the CROSSBAR CONTROL on the Primary Signal Selector panel to 255. When

NOTE: Steps 10 through 13 determine the time of day at which the high order scaler, Channel 3, will overflow. Do not enter the PIPA and IRIG Tests (JDC 12617), the PIPA Scale Factor Tests (JDC 12624), or the PIPA Misalignment Tests (JDC 12625) within 0.2 hours of that time. If the high order scaler were to overflow during the performance of such tests, erroneous test results would occur. The high order scaler will overflow every 23.3 hours. If testing continues for more than one day without system turnoff, determine the time of scaler overflow for each day of testing.

11. Perform the following DSKY operations:  
VERB 01 NOUN 10 ENTR  
00003 ENTR  
DATE 15 MAR 66

APOLLO G&N  
EQUIPMENT TEST  
DATA SHEET 1 OF 1

JDC 12614 REV. D

TEST HISTORY

TITLE	DATE	START	END	SITE / LOCATION
SER. NO.	DWG	REV.	TIME	TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT

NAME SER. NO. CAL DATE

NAME SER. NO. CAL DATE

CONDUCTED BY NAME/AFFILIATION APPROVED BY NAME/AFFILIATION

JDC ITEM NUMBER	RECORDED VALUES AND CALCULATIONS
11	Row 1 indication = Time of day =
13	Row 1 indication =
14	Hours in high order scaler = $\frac{\text{line c}}{3600} \times 5.12$ Time to overflow = 23.3 - line d = _____ hours Time of overflow = line b + line e = _____

DATE

FORM 00146  
Chg. 7-23-65

# GENERAL TURNON AND TURNOFF PROCEDURES FOR THE G & N SYSTEM

JDC 12614 REV. D PAGE 1 OF 3  
INITIAL TDRR 27134 DS P 3 1

## SUBSYSTEM LEM G & N SYSTEM

Once the G & N System has been assembled and initial turn on has been performed, the G & N System will have to be turned on and off many times. This procedure shall be utilized as applicable.

Rev.	Date	TDRR NO.	PAGES REVISED	APPROVAL	REFERENCES
1	A 5-25-66	29176	All	D.S.	PS-6015000
2	B 7-5-66	30044	3	MM (S) ACMD	
3	C 10-20-66	31616	2, 3	MM (S) ACMD	
4	D 12-28-66	32478	All	EA-1	IMPORTANT Inertial Component scale factor change may result if this procedure is not strictly adhered to.
				JP-1	INTERVAL
					TOOLS AND MATERIAL

### A. GENERAL G & N TURNON PROCEDURE

1. Turn on the OIA, Coolant and Power Console and CTS in accordance with applicable turnon procedures.

NOTE: Ascertain that all parameters are within listed tolerances.

2. Establish a Master Initialization Condition.

3. Press the CGC/ LGC POWER ON and the 400 CPS POWER ON pushbuttons on the Test Control panel. After the CGC/ LGC POWER ON, 400 CPS POWER ON and the PROCEED portion of the PROCEED/ISS STANDBY pushbuttons light, press the PROCEED/ISS STANDBY pushbutton. The PSA HTR PWR pushbutton on the Temperature Monitor Console shall light. Record the time in the system log.

4. Insure that the STBY Condition lamp on the DSKY is not lighted. If it is, press and hold the STBY pushbutton until the lamp goes out.

5. Press the ALARM RESET pushbutton on the Programmer and Monitor panel of the CTS.

6. Perform the following DSKY operations:

- VERB 36 ENTR
- RESET PRE 38
- VERB 57 ENTR
- 00015 ENTR

VERIFICATION WITH SIDL REQUIRED BEFORE USE  
DATE 15 MAR 66

FORM 00143  
Chg. 7-23-65

# GENERAL TURNON AND TURNOFF PROCEDURES FOR THE G & N SYSTEM

JDC 12614 REV. D PAGE 3 OF 3

## SUBSYSTEM LEM G & N SYSTEM

Record the indication of Row 1 and the time of day.

12. Perform the following DSKY operations:

- VERB 21 NOUN 01 ENTR
- 01300 ENTR
- Row 1 indication from step 10 ENTR

13. Perform the following DSKY operations:

- VERB 06 NOUN 02 ENTR
- 01300 ENTR

Record the indication of Row 1.  
14. Perform the calculations on the calculation sheet.

B. GENERAL G & N SYSTEM - OIA DOWN  
MODING FROM ISS OPERATE AND ANY G & N MODE

1. Perform the following DSKY operations:

- VERB 41 NOUN 20 ENTR
- Observe
- VERB 21 NOUN 22 Flashing ENTR
- +00000
- Observe
- VERB 22 NOUN 22 Flashing ENTR
- +00000
- Observe
- VERB 23 NOUN 22 Flashing ENTR
- +09000

2. Press the PROCEED/ISS STANDBY pushbutton on the Test Control panel. The PROCEED portion shall go out and the ISS STANDBY portion shall light.

## APOLLO GAN EQUIPMENT TEST DATA SHEET 1 OF 1

JDC 12614 REV. D INITIAL TDRR

JOB GENERAL TURNON AND TURNOFF PROCEDURES FOR THE G & N SYSTEM

ASSEMBLY UNDER TEST		TEST HISTORY	
TITLE	DATE	START	END
SER. NO.	DWG	REV.	SITE / LOCATION
		TIME	END
		START	TOTAL ELAPSED
MAJOR GROUND SUPPORT EQUIPMENT			
NAME	SER. NO.	CAL DATE	
NAME	SER. NO.	CAL DATE	
CONDUCTED BY	NAME/AFFILIATION	APPROVED BY	NAME/AFFILIATION

JDC ITEM NUMBER	RECORDED VALUES AND CALCULATIONS
11	Row 1 indication = Time of day =
13	Row 1 indication =
14	Hours in high order scaler = $\frac{\text{line c}}{3600} \times 5.12$ Time to overflow = 23.3 - line d = _____ hours Time of overflow = line b + line e = _____

DATE 15 MAR 66

FORM 00146  
Chg. 7-23-65

# GENERAL TURNON AND TURNOFF PROCEDURES FOR THE G & N SYSTEM

JDC 12614 REV. D PAGE 2 OF 3

## SUBSYSTEM LEM G & N SYSTEM

NOTE: Allow 2 hours to elapse before proceeding to step 6 with the following exceptions:

a. If the G & N System has been in the power off state for less than 5 days with the gimbals in the parked position (inner and Outer gimbal at 0° and Middle gimbal at 90°) and the system has not been moved, allow 90 seconds to elapse before proceeding.

b. If the G & N System has been in the power off state for less than 15 minutes with the gimbals in the unparked position allow 90 seconds to elapse before proceeding.

c. If the G & N System has been in the power off state with the gimbals in the unparked position for more than 15 minutes but less than 2 hours, allow a warmup time equal to the time off to elapse before proceeding.

7. Insure that the PROCEED portion of the PROCEED/ISS OPERATE pushbutton is lighted and the Standby requirements have been met. Measure the PIPA temperature by setting the CROSSBAR CONTROL on the Primary Signal Selector panel to 255. When

the DVM indicates 0 (±0.75) vdc proceed to step 7.

8. Press the PROCEED/ISS OPERATE pushbutton on the Test Control panel.

9. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 173 to measure the G & N 28 vdc on the DVM.

10. Adjust the G & N POWER ADJUST control on the Test Control panel until the DVM indicates 28.0 (±0.25) vdc.

NOTE: Steps 10 through 13 determine the time of day at which the high order scaler, Channel 3, will overflow.

Do not enter the PIPA and IRIG Tests (JDC 12617), the PIPA Scale Factor Tests (JDC 12624), or the PIPA Misalignment Tests (JDC 12625) within 0.2 hours of that time. If the high order scaler were to overflow during the performance of such tests, erroneous test results would occur. The high order scaler will overflow every 23.3 hours. If testing continues for more than one day without system turnoff, determine the time of scaler overflow for each day of testing.

11. Perform the following DSKY operations:

- VERB 01 NOUN 10 ENTR
- 00003 ENTR

DATE 15 MAR 66



SUBSYSTEM LEM G & N SYSTEM

ASSY

Once the G & N System has been assembled and initial turn on has been performed, the G & N System will have to be turned on and off many times. This procedure shall be utilized as applicable.

Rev. Let.	Date	TORR NO.	PAGES REVISED	APPROVAL	REFERENCES
A	5-25-66	29176	JDC	MIT NASA	PS-6015000
B	7-5-66	30044	3	MMW ACN	
C	10-20-66	31616	2,3	FA	IMPORTANT Inertial Component scale factor change may result if this procedure is not strictly adhered to.
D	12-28-66	32478	All	JP	
E	4-20-67	33652	All	EA	INTERVAL
					TOOLS AND MATERIAL

- A. GENERAL G & N TURNON PROCEDURE
- Turn on the OIA, Coolant and Power Console and CTS in accordance with applicable turnon procedures.  
NOTE: Ascertain that all parameters are within listed tolerances.
  - Press the CGC/LOC POWER ON and the 400 CP8 POWER ON pushbuttons on the Test Control panel. After the CGC/LOC POWER ON, 400 CP8 POWER ON and the PROCEED portion of the PROCEED/ISS STANDBY pushbuttons light, press the PROCEED/ISS STANDBY pushbutton. The PSA HTR PWR pushbutton on the Temperature Monitor Control panel shall light. Record the time in the system log.
  - Ensure that the STBY Condition lamp on the DSKY is not lighted. If it is, press and hold the STBY pushbutton until the lamp goes out.
  - Press the ALARM RESET pushbutton on the Programmer and Monitor panel of the CTS.
  - Perform the following DSKY operations:
    - VERB 36 ENTR
    - RESET PRESS
    - VERB 57 ENTR
    - 00015 ENTR

VERIFICATION WITH SID REQUIRED BEFORE USE

DATE 15 MAY 66

FCR 1 00143  
Chg: 7-23-65

SUBSYSTEM LEM G & N SYSTEM

ASSY

NOTE: Allow 2 hours to elapse before proceeding to step 6 with the following exceptions:

- If the G & N System has been in the power off state for less than 5 days with the gimbal in the parked position (inner and Outer gimbal at 0° and Middle gimbal at 90°) and the system has not been moved, allow 90 seconds to elapse before proceeding.
- If the G & N System has been in the power off state for less than 15 minutes with the gimbal in the unparked position allow 90 seconds to elapse before proceeding.
- If the GSE temperature controller has been allowed to maintain an IRIG temperature greater than 135°F, allow 30 minutes to elapse before proceeding.

- Ensure that the PROCEED portion of the PROCEED/ISS OPERATE pushbutton is lighted and the Standby requirements have been met. Measure the PIPA temperature by setting the CROSSEAR CONTROL on the Primary Signal Selector panel to 255. When the DVM indicates 0 (±0.75) vdc proceed to step 7.
- Press the PROCEED/ISS OPERATE pushbutton on the Test Control panel.
- Set the CROSSEAR CONTROL on the Primary Signal Selector panel to 173 to measure the G & N 28 vdc on the DVM.
- Adjust the G & N POWER ADJUST control on the Test Control panel until the DVM indicates 28.0 (±0.25) vdc.

DATE 15 MAR 66

- SUBSYSTEM LEM G & N SYSTEM
- ASSY
- NOTE: Steps 10 through 13 determine the time of day at which the high order scaler, Channel 3, will overflow. Do not enter the PIPA and IRIG Tests (JDC 12617) or the PIPA Misalignment Tests (JDC 12625) if less than 12 minutes remain before time of overflow. Do not initialize an IMU Performance Test position (JDC 12624) if less than 90 minutes remain before time of overflow. If the high order scaler were to overflow during the performance of such tests, erroneous test results would occur. The high order scaler will overflow every 23.3 hours. If testing continues for more than one day without system turnoff, determine the time of scaler overflow for each day of testing.
- Perform the following DSKY operations:

VERB 01	NOUN 10	ENTR
00003		ENTR

Record the indication of Row 1 and the time of day.
  - Perform the following DSKY operations:

VERB 21	NOUN 01	ENTR
---------	---------	------

DATE 15 MAR 66

- SUBSYSTEM LEM G & N SYSTEM
- ASSY
- NOTE: If a lower mode than ISS Standby is desired, proceed.
- Press the OIA ON/ISS POWER DISABLED pushbutton.
  - Perform the following DSKY operations:

VERB 21	NOUN 10	ENTR
00013		ENTR
02000		ENTR

Press and hold the STBY pushbutton until the STBY condition lamp lights.
  - Press the CGC/LOC POWER ON and the 400 CP8 POWER ON pushbuttons on the Test Control panel. The pushbuttons shall go out.
  - NOTE: If a lower mode than OIA ON is desired, proceed.
  - Press the POWER OFF pushbutton on the Test Control panel of the OIA or on the Emergency Shut Down panel of the Coolant Console. The OIA PILOT POWER lamp on the Test Control panel shall light. The AUX HTR PWR lamp on the Temperature Monitor Control panel shall light. Record the time off in the system log.

DATE 15 MAR 66

APOLLO G&N  
EQUIPMENT TEST  
DATA SHEET 1 OF 1

JOB GENERAL TURNON AND TURNOFF PROCEDURES FOR THE G & N SYSTEM

JDC
NO. 12614
REV. E
INITIAL TDOR 27114

ASSEMBLY UNDER TEST		TEST HISTORY	
TITLE	DATE	START	END SITE / LOCAT ON
SER. NO.	DWG	REV	TIME START END TOTAL ELAPSD
MAJOR GROUND SUPPORT EQUIPMENT			
NAME	SER. NO.	SER. NO.	CAL DATE
NAME	SER. NO.	SER. NO.	CAL DATE
CONDUCTED BY		NAME/AFFILIATION	APPROVED BY
NAME/AFFILIATION		NAME/AFFILIATION	

JDC ITEM NUMBER	RECORDED VALUES AND CALCULATIONS
10	Row 1 indication = --- minutes Time of day = --- hours --- minutes
12	Row 1 indication = ---
13	Hours in high order scalar = $\frac{\text{line e}}{3600} \times 5.12$ = --- hours Time to overflow = 23.3 - line d = --- hours Line e converted to hours and minutes = --- hours --- minutes Time of overflow = line b + line f = --- hours --- minutes

DATE 15 MAR 66

FOR 00146  
Chg. 7-23-65





APOLLO G&N  
EQUIPMENT TEST  
DATA SHEET 1 OF 1

JDC  
NO. 12814  
REV. F  
INITIAL TDPR 27134

JOB GENERAL TURNON AND TUNOFF PROCEDURES FOR THE G & N SYSTEM

ASSEMBLY UNDER TEST				TEST HISTORY			
TITLE	DATE	START	END	SITE / LOCATION	SER. NO.	DWG	REV.
SER. NO.	TIME	START	END	TOTAL ELAPSED	SER. NO.	SER. NO.	CAL DATE
MAJOR GROUND SUPPORT EQUIPMENT							
CONDUCTED BY _____ APPROVED BY _____							
NAME/AFFILIATION _____ NAME/AFFILIATION _____							
JDC ITEM NUMBER	RECORDED VALUES AND CALCULATIONS						
10	Row 1 Indication = _____ minutes						
12	Time of day = _____ hours _____ minutes						
13	Row 1 Indication = _____ hours						
	Hours in high order scaler = $\frac{\text{line c}}{3600} \times 5.12$						
	Time to overflow = 23.3 - line d = _____ hours						
	Line e converted to hours and minutes = _____ hours _____ minutes						
	Time of overflow = line b + line f = _____ hours _____ minutes						

DATE 15 MAR 68  
FORM 0145  
C.46. 1-3-65

DESCRIPTION Once the G & N System has been assembled and initial turn on has been performed, the G & N System will have to be turned on and off many times. This procedure shall be utilized as applicable.

Rev.	Let.	Date	TORR NO.	PAGES REVISED	APPROVAL	REFERENCES
A	8-25-66	28176	ALL	3	MIT NASA	PS-6015000
B	7-5-66	30044	3	3	MMB ACME	
C	10-20-68	31616	2,3	1	EA	IMPORTANT: Inertial Component scale factor change may result if the procedure is not strictly adhered to.
D	12-28-68	32478	ALL	ALL	JP	INTERVAL
E	4-0-67	33652	ALL	ALL	EA	
F	9-21-67	34647	4	1	EA	
G	8-28-68	35981	1,2,4	1	EA	TOOLS AND MATERIAL

A. GENERAL G & N TURNON PROCEDURE

- Turn on the OIA, Coolant and Power Console and CTS in accordance with applicable turnon procedures.
- Press the CGC/LGC POWER ON and the 400 CPS POWER ON pushbuttons on the Test Control panel. After the CGC/LGC POWER ON, 400 CPS POWER ON and the PROCEED portion of the PROCEED/ISS STANDBY pushbuttons light, press the PROCEED/ISS STANDBY pushbutton. The PRA HTR PWR pushbutton on the Temperature Monitor Control panel shall light. Record the time in the system log.
- Ensure that the STBY Condition lamp on the DSKY is not lighted. If it is, press and hold the PRO (or STBY) pushbutton until the lamp goes out.
- Press the ALARM RESET pushbutton on the Programmer and Monitor panel of the CTS.
- Perform the following DSKY operations:
  - VERB 36 ENTR
  - RESET PRESS
  - VERB 57 ENTR
  - 00016 ENTR

VERIFICATION WITH SIDL REQUIRED BEFORE USE

DATE 15 MAR 66

FORM 100-13  
CNS 7-2-65

GENERAL TURNON AND TURNOFF PRO-  
CEDURES FOR THE G & N SYSTEM

SUBSYSTEM LEM G & N SYSTEM

- NOTE: Steps 10 through 13 determine the time of day at which the high order scaler, Channel 3, will overflow. Do not enter the PIPA and IRIG Tests (JDC 12617) or the PIPA Misalignment Tests (JDC 12625) if less than 13 minutes remain before time of overflow. Do not initialize an IMU Performance Test position (JDC 12624) if less than 90 minutes remain before time of overflow. If the high order scaler were to overflow during the performance of such tests, erroneous test results would occur. The high order scaler will overflow every 23.3 hours. If testing continues for more than one day without system turnoff, determine the time of scaler overflow for each day of testing.
- Perform the following DSKY operations:
    - VERB 01 NOUN 10 ENTR
    - 00003 ENTRRecord the indication of Row 1 and the time of day.
  - Perform the following DSKY operations:
    - VERB 21 NOUN 01 ENTR

VERB 21 NOUN 01 ENTR

DATE 15 MAR 66

GENERAL TURNON AND TURNOFF PRO-  
CEDURES FOR THE G & N SYSTEM

SUBSYSTEM LEM G & N SYSTEM

ASSY

NOTE: Standby Requirements. Allow 2 hours to elapse before proceeding to step 6 with the following exceptions:

- If the G & N System has been in the power off state for less than 5 days with the gimbal in the parked position (inner and Outer gimbal at 0° and Middle gimbal at 90°) and the system has not been moved, allow 90 seconds to elapse before proceeding.
- If the G & N System has been in the power off state for less than 15 minutes with the gimbal in the unparked position allow 90 seconds to elapse before proceeding.
- If the GSE temperature controller has been allowed to maintain an IRIG temperature greater than 130°F, allow 30 minutes to elapse before proceeding.

- If the G & N System has been in the power off state with the gimbal in the unparked position for more than 15 minutes but less than 2 hours, allow a warmup time equal to the time off to elapse before proceeding.
- Ensure that the PROCEED portion of the PROCEED/ISS OPERATE pushbutton is lighted and the Standby requirements have been met. Measure the PIPA temperature by setting the CROSSBAR CONTROL on the Primary Signal Selector panel to 25S. When the DVM indicates 0 (±0.75) vdc proceed to step 7.
  - Press the PROCEED/ISS OPERATE pushbutton on the Test Control panel.
  - Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 173 to measure the G & N 28 vdc on the DVM.
  - Adjust the G & N POWER ADJUST control on the Test Control panel until the DVM indicates 28.0 (±0.25) vdc.

DATE 15 MAR 66

GENERAL TURNON AND TURNOFF PRO-  
CEDURES FOR THE G & N SYSTEM

SUBSYSTEM LEM G & N SYSTEM

ASSY

NOTE: If a lower mode than ISS Standby is desired, proceed.

- Press the OIA ON/ISS POWER DISABLED pushbutton.
- Perform following DSKY operations:
  - VERB 57 ENTR
  - Observe
  - VERB 21 NOUN 01 Flashing ENTR
  - 00015 ENTR
  - Observe all status lamps are off.
- Perform the following DSKY operations:
  - VERB 21 NOUN 10 ENTR
  - 00013 ENTR
  - 02000 ENTRPress and hold the PRO (or STBY) pushbutton until the STBY condition lamp lights.
- Press the CGC/LGC POWER ON and the 400 CPS POWER ON pushbuttons on the Test Control panel. The pushbuttons shall go out.
- NOTE: If a lower mode than OIA ON is desired, proceed.
- Press the POWER OFF pushbutton on the Test Control panel of the OIA or on the Emergency Shut Down panel of the Coolant Console. The OIA PILOT POWER lamp on the Test Control panel shall light. The AUX HTR PWR lamp on the Temperature Monitor Control panel shall light. Record the time off in the system log.

DATE 15 MAR 66

APOLLO G&N  
EQUIPMENT TEST  
DATA SHEET 1 OF 1

JDC  
NO. 1281A  
REV. G  
INITIAL TDRR 27131

JOB GENERAL TURNON AND TURNOFF PROCEDURES FOR THE G&N SYSTEM

ASSEMBLY UNDER TEST				TEST HISTORY			
TITLE		DATE		END		SITE / LOCATION	
SER. NO.	DWG.	REV.	TIME	START	END	TOTAL ELAPSED	
MAJOR GROUND SUPPORT EQUIPMENT							
NAME		SER. NO.		CAL DATE			
NAME		SER. NO.		CAL DATE			
CONDUCTED BY		NAME/AFFILIATION		APPROVED BY		NAME/AFFILIATION	
RECORDED VALUES AND CALCULATIONS							
JDC ITEM NUMBER							
10	Row 1 indication = --- hours --- minutes						
12	Row 1 indication = --- hours --- minutes						
13	Hours in high order scaler = $\frac{\text{line g}}{3600} \times 5.12$ = --- hours						
	Time to overflow = 23.3 - line d = --- hours						
	Line e converted to hours and minutes = --- hours --- minutes						
	Time of overflow = line b + line f = --- hours --- minutes						

DATE 15 MAR 68

FORM 0146  
Chg. 7-13-65



SUBSYSTEM LEM G & N SYSTEM

ASSY

DESCRIPTION Once the G & N System has been assembled and initial turn on has been performed, the G & N System will have to be turned on and off many times. This procedure shall be utilized as applicable.

Rev.	Date	TORR	PAGES REVISED	APPROVAL	REFERENCES
1	25-56	29176	All	W1	NASA
2	7-5-66	30044	3	MM	ACM
3	10-04-68	31616	2,3	EA	1
4	12-08-68	32478	All	EA	1
5	14-07-67	33652	All	EA	1
6	18-01-67	34647	4	EA	1
7	18-01-67	35981	1,2,4	EA	1
8	18-01-67	36047	1,4	EA	1
9	18-01-67	36047	1,4	EA	1
10	18-01-67	36047	1,4	EA	1
11	18-01-67	36047	1,4	EA	1
12	18-01-67	36047	1,4	EA	1
13	18-01-67	36047	1,4	EA	1
14	18-01-67	36047	1,4	EA	1
15	18-01-67	36047	1,4	EA	1
16	18-01-67	36047	1,4	EA	1
17	18-01-67	36047	1,4	EA	1
18	18-01-67	36047	1,4	EA	1
19	18-01-67	36047	1,4	EA	1
20	18-01-67	36047	1,4	EA	1
21	18-01-67	36047	1,4	EA	1
22	18-01-67	36047	1,4	EA	1
23	18-01-67	36047	1,4	EA	1
24	18-01-67	36047	1,4	EA	1
25	18-01-67	36047	1,4	EA	1
26	18-01-67	36047	1,4	EA	1
27	18-01-67	36047	1,4	EA	1
28	18-01-67	36047	1,4	EA	1
29	18-01-67	36047	1,4	EA	1
30	18-01-67	36047	1,4	EA	1
31	18-01-67	36047	1,4	EA	1
32	18-01-67	36047	1,4	EA	1
33	18-01-67	36047	1,4	EA	1
34	18-01-67	36047	1,4	EA	1
35	18-01-67	36047	1,4	EA	1
36	18-01-67	36047	1,4	EA	1
37	18-01-67	36047	1,4	EA	1
38	18-01-67	36047	1,4	EA	1
39	18-01-67	36047	1,4	EA	1
40	18-01-67	36047	1,4	EA	1
41	18-01-67	36047	1,4	EA	1
42	18-01-67	36047	1,4	EA	1
43	18-01-67	36047	1,4	EA	1
44	18-01-67	36047	1,4	EA	1
45	18-01-67	36047	1,4	EA	1
46	18-01-67	36047	1,4	EA	1
47	18-01-67	36047	1,4	EA	1
48	18-01-67	36047	1,4	EA	1
49	18-01-67	36047	1,4	EA	1
50	18-01-67	36047	1,4	EA	1
51	18-01-67	36047	1,4	EA	1
52	18-01-67	36047	1,4	EA	1
53	18-01-67	36047	1,4	EA	1
54	18-01-67	36047	1,4	EA	1
55	18-01-67	36047	1,4	EA	1
56	18-01-67	36047	1,4	EA	1
57	18-01-67	36047	1,4	EA	1
58	18-01-67	36047	1,4	EA	1
59	18-01-67	36047	1,4	EA	1
60	18-01-67	36047	1,4	EA	1
61	18-01-67	36047	1,4	EA	1
62	18-01-67	36047	1,4	EA	1
63	18-01-67	36047	1,4	EA	1
64	18-01-67	36047	1,4	EA	1
65	18-01-67	36047	1,4	EA	1
66	18-01-67	36047	1,4	EA	1
67	18-01-67	36047	1,4	EA	1
68	18-01-67	36047	1,4	EA	1
69	18-01-67	36047	1,4	EA	1
70	18-01-67	36047	1,4	EA	1
71	18-01-67	36047	1,4	EA	1
72	18-01-67	36047	1,4	EA	1
73	18-01-67	36047	1,4	EA	1
74	18-01-67	36047	1,4	EA	1
75	18-01-67	36047	1,4	EA	1
76	18-01-67	36047	1,4	EA	1
77	18-01-67	36047	1,4	EA	1
78	18-01-67	36047	1,4	EA	1
79	18-01-67	36047	1,4	EA	1
80	18-01-67	36047	1,4	EA	1
81	18-01-67	36047	1,4	EA	1
82	18-01-67	36047	1,4	EA	1
83	18-01-67	36047	1,4	EA	1
84	18-01-67	36047	1,4	EA	1
85	18-01-67	36047	1,4	EA	1
86	18-01-67	36047	1,4	EA	1
87	18-01-67	36047	1,4	EA	1
88	18-01-67	36047	1,4	EA	1
89	18-01-67	36047	1,4	EA	1
90	18-01-67	36047	1,4	EA	1
91	18-01-67	36047	1,4	EA	1
92	18-01-67	36047	1,4	EA	1
93	18-01-67	36047	1,4	EA	1
94	18-01-67	36047	1,4	EA	1
95	18-01-67	36047	1,4	EA	1
96	18-01-67	36047	1,4	EA	1
97	18-01-67	36047	1,4	EA	1
98	18-01-67	36047	1,4	EA	1
99	18-01-67	36047	1,4	EA	1
100	18-01-67	36047	1,4	EA	1

# A. GENERAL G & N TURNON PROCEDURE

- Turn on the OIA, Coolant and Power Console and CTS in accordance with applicable turnon procedures.
- Press the COC/LOC POWER ON and the 400 CPS POWER ON pushbuttons on the Test Control panel. TEMP alarm lamp on DSKY may light. After the COC/LOC POWER ON, 400 CPS POWER ON and the PROCEED portion of the PROCEED/ISS STANDBY pushbutton light, press the PROCEED/ISS STANDBY pushbutton. The PSA HTR PWR pushbutton on the Temperature Monitor Control panel shall light. Record the time in the system log.
- If STBY condition lamp on DSKY is lighted, press and hold PRO (or STBY) pushbutton until lamp goes out. If lamp does not

VERIFICATION WITH SID REQUIRED BEFORE USE

DATE 15 MAR 66

FORM 00000  
Chg. 1-15-66

SUBSYSTEM LEM G & N SYSTEM

ASSY

- Observe:  
VERB 21 NOUN 15 Flashing  
J. 00000 ENTR ENTR
- Observe:  
VERB 21 NOUN 15 Flashing  
L. 00000 ENTR ENTR
- Observe:  
VERB 21 NOUN 15 Flashing  
M. 00000 ENTR ENTR
- Observe:  
VERB 21 NOUN 15 Flashing  
N. 00000 ENTR ENTR
- Observe:  
VERB 21 NOUN 27 Flashing  
P. 00000 ENTR ENTR
- Observe:  
VERB 21 NOUN 27 Flashing  
Q. 00010 ENTR ENTR

Allow test to run for 5 minutes. Record any failures indicated by VERB 06 NOUN 21 being displayed on DSKY. If no failure occurs, write "None" on data sheet.

NOTE: Standby Required. Allow 3 hours to elapse before proceeding to step 6 with the following exceptions:

- If the G & N System has been in the power off state for less than 5 days with the gimbal in the parked position (inner and Outer gimbal at 0° and Middle gimbal at 90°) and the system has not been moved, allow 90 seconds to elapse before proceeding.
- Ensure that the PROCEED portion of the PROCEED/ISS OPERATE pushbutton is lighted and the Standby requirements have been met. Measure the PIPA temperature by setting the CROSBAR CONTROL on the Primary Signal Selector panel to 255. When the DVM indicates 0 (±0.75) vdc proceed to step 7.

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SUBSYSTEM LEM G & N SYSTEM

ASSY

- Press the PROCEED/ISS OPERATE pushbutton on the Test Control panel.
- Set the CROSBAR CONTROL on the Primary Signal Selector panel to 173 to measure the G & N 28 vdc on the DVM.
- Adjust the G & N POWER ADJUST control on the Test Control panel until the DVM indicates 28.0 (±0.25) vdc.

NOTE: Steps 10 through 13 determine the time of day at which the high order scaler, Channel 3, will overflow. Do not enter the PIPA and IRIG Tests (JDC 12617) or the PIPA Misalignment Tests (JDC 12625) if less than 12 minutes remain before time of overflow. Do not initialize an IMU Performance Test position (JDC 12624) if less than 90 minutes remain before time of overflow. If the high order scaler were to overflow during the performance of such tests, erroneous test results would occur. The high order scaler will overflow every 23.3 hours. If testing continues for more than one day without system turnoff, determine the time of scaler overflow for each day of testing.

- Perform the following DSKY operations:  
VERB 01 NOUN 10 ENTR  
00003 ENTR  
Record the indication of Row 1 and the time of day.
- Perform the following DSKY operations:  
VERB 21 NOUN 01 ENTR  
01300 ENTR  
Row 1 indication from step 10
- Perform the following DSKY operations:  
VERB 06 NOUN 02 ENTR  
01300 ENTR  
Record the indication of Row 1.
- Perform the calculations on the calculation sheet.
- Perform JDC 12613 to establish a Master Initialization condition.

# B. GENERAL G & N SYSTEM - OIA DOWN MODING FROM ISS OPERATE AND ANY G & N MODE

- Perform the following DSKY operations:  
a. VERB 41 NOUN 20 ENTR  
b. Observe  
VERB 21 NOUN 22 Flashing  
c. +00000 ENTR  
d. Observe  
VERB 22 NOUN 22 Flashing

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SUBSYSTEM LEM G & N SYSTEM

ASSY

- +00000 ENTR
- Observe  
VERB 23 NOUN 22 Flashing  
+00000 ENTR
- Press the PROCEED/ISS STANDBY pushbutton on the Test Control panel. The PROCEED portion shall go out and the ISS STANDBY portion shall light.
- Press the OIA ON/ISS POWER DIS-ABLED pushbutton.
- Perform following DSKY operations:  
a. VERB 57 ENTR  
b. Observe  
VERB 21 NOUN 01 Flashing  
c. 00015 ENTR
- Observe all status lamps are off. TEMP alarm lamp on DSKY may light.
- Perform the following DSKY operations:  
VERB 21 NOUN 10 ENTR  
00013 ENTR  
02000 ENTR

NOTE: If a lower mode than OIA ON is desired, proceed.

- Press the POWER OFF pushbutton on the Test Control panel of the OIA or on the Emergency Shut Down panel of the Coolant Console. The OIA PILOT POWER lamp on the Test Control panel shall light. The AUX HTR PWR lamp on the Temperature Monitor Control panel shall light. Record the time off in the system log.
- Shutting down of the test station is desired, proceed to step 6.
- Set the Main Power switch on the G & N Coolant and Power Console to OFF.
- Set the TEST SET POWER and STATION POWER switches on the CTS to the OFF position.

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APOLLO GSN  
EQUIPMENT TEST  
DATA SHEET 1 OF 1

JDC  
NO. 1261A  
REV. H  
INITIAL TDR 27131

JOB GENERAL TURNON AND TURNOFF PROCEDURES FOR THE G & N SYSTEM

ASSEMBLY UNDER TEST				TEST HISTORY				
TITLE	DATE	START	END	SITE / LOCATION	TIME	START	END	TOTAL ELAPSED
SER. NO.	DWG	REV.						

MAJOR GROUND SUPPORT EQUIPMENT			
NAME	SER. NO.	CAL DATE	
NAME	SER. NO.	CAL DATE	
CONDUCTED BY _____ APPROVED BY _____			
NAME/AFFILIATION _____			

JDC ITEM NUMBER	RECORDED VALUES AND CALCULATIONS
8	Self test failures _____
10	Row 1 indication = _____
	Time of day = _____ hours _____ minutes
12	Row 1 indication = _____
13	Hours in high order scaler = $\frac{\text{line c}}{3600} \times 5.12$
	= _____ hours
	Time to overflow = 23.3 - line d = _____ hours
	Line e converted to hours and minutes = _____ hours _____ minutes
	Time of overflow = line b + line f = _____ hours _____ minutes

DATE 15 MAR 68

FORM 00146  
Chg. 7-13-65

**DESCRIPTION** Once the G & N System has been assembled and initial turn on has been performed, the G & N System will have to be turned on and off many times. This procedure shall be utilized as applicable.

Rev.	Date	TDRR NO.	PAGES REVISED	APPROVAL	REFERENCES
A	5-25-66	29176	All	M.I. NASA	PGS-6015000
B	7-5-66	30044	3	MM. J. ACMA	
C	10-04-68	31616	2,3	MM. J. ACMA	
D	12-24-68	32478	All	J.P. J.	IMPORTANT Inertial Component scale factor change may result if this procedure is not strictly adhered to.
E	4-20-67	33652	All	EA J.	INTERVAL
F	9-21-67	34647	4	EA J.	
G	8-28-68	35961	1,2,4	EA J.	TOOLS AND MATERIAL
H	4-9-68	36047	1,4	EA J.	
J	8-5-68	36528	1,4	EA J.	

**A. GENERAL G & N TURNOFF PROCEDURE**

- Turn on the OIA, Coolant and Power Console and CTS in accordance with applicable turnon procedures.
- Press the COC/LGC POWER ON and the 400 CPS POWER ON pushbuttons on the Test Control panel. The LGC WARNING lamp on the Monitor panel may remain on for approximately 10 seconds following application of +28 VDC LGC operate power. TEMP alarm lamp on DSKY may light. After the COC/LGC POWER ON, 400 CPS POWER ON and the PROCEED/ISS portion of the PROCEED/ISS STANDBY pushbuttons light, press the PROCEED/ISS STANDBY pushbutton. The PSA HTR PWR pushbutton on the Temperature Monitor Control panel shall light. Record the time in the system log.
- If STBY condition lamp on DSKY is lighted, press and hold PRO (or STBY) pushbutton until lamp goes out. If lamp does not

go out within 5 seconds, release and press pushbutton again. If PRO (or STBY) pushbutton is pressed more than once, record in the System log the number of times pressed.

- Press the ALARM RESET pushbutton on the Programmer and Monitor panel of the CTS.
- Perform the following DSKY operations:
  - VERB 21 NOUN 01 ENTR
  - Observe:
    - VERB 21 NOUN 01 Flashing ENTR
    - 01362 ENTR
    - 00000 ENTR
  - Observe:
    - VERB 21 NOUN 01 Flashing ENTR
    - 01365 ENTR
    - 00000 ENTR
  - NOUN 15 ENTR

4. Press the COC/LGC POWER ON and the 400 CPS POWER ON pushbuttons on the Test Control panel. The LGC WARNING lamp on the Monitor panel may remain on for approximately 10 seconds following application of +28 VDC LGC operate power. TEMP alarm lamp on DSKY may light. After the COC/LGC POWER ON, 400 CPS POWER ON and the PROCEED/ISS portion of the PROCEED/ISS STANDBY pushbuttons light, press the PROCEED/ISS STANDBY pushbutton. The PSA HTR PWR pushbutton on the Temperature Monitor Control panel shall light. Record the time in the system log.

- VERB 21 NOUN 01 ENTR
- Observe:
  - VERB 21 NOUN 01 Flashing ENTR
  - 01362 ENTR
  - 00000 ENTR
- Observe:
  - VERB 21 NOUN 01 Flashing ENTR
  - 01365 ENTR
  - 00000 ENTR
- NOUN 15 ENTR

VERIFICATION WITH SID REQUIRED BEFORE USE

DATE 15 MAR 66

- Observe:
    - VERB 21 NOUN 15 Flashing ENTR ENTR
    - 00000
  - Observe:
    - VERB 21 NOUN 15 Flashing ENTR ENTR
    - 00000
  - Observe:
    - VERB 21 NOUN 15 Flashing ENTR ENTR
    - 00000
  - Observe:
    - VERB 21 NOUN 27 ENTR
    - 00000
  - Observe:
    - VERB 21 NOUN 27 Flashing ENTR
    - 00010
- Allow test to run for 5 minutes. Record any failures indicated by VERB 06 NOUN 31 being displayed on DSKY. If no failure occurs, write "None" on data sheet.

**NOTE: Standby Requirements.** Allow 5 hours to elapse before proceeding to step 6 with the following exceptions:

- If the G & N System has been in the power off state for less than 5 days with the gimbal in the parted position (inner and Outer gimbal at 0° and Middle gimbal at 90°) and the system has not been moved, allow 90 seconds to elapse before proceeding.

- Ensure that the PROCEED portion of the PROCEED/ISS OPERATE pushbutton is lighted and the Standby requirements have been met. Measure the PIPA temperature by setting the CROSSBAR CONTROL on the Primary Signal Selector panel to 256. When the DVM indicates 0 (±0.75) vdc proceed to step 7.

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- Press the PROCEED/ISS OPERATE pushbutton on the Test Control panel.
- Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 173 to measure the G & N 28 vdc on the DVM.
- Adjust the G & N POWER ADJUST control on the Test Control panel until the DVM indicates 28.0 (±0.25) vdc.

**NOTE: Steps 10 through 13**  
Determine the time of day at which the high order scaler, Channel 3, will overflow. Do not enter the PIPA and IRIG Tests (JDC 12617) or the PIPA Misalignment Tests (JDC 12625) if less than 12 minutes remain before time of overflow. Do not initialize an IMU Performance Test position (JDC 12624) if less than 90 minutes remain before time of overflow. If the high order scaler were to overflow during the performance of such tests, erroneous test results would occur. The high order scaler will overflow every 23.3 hours. If testing continues for more than one day without system turnoff, determine the time of scaler overflow for each day of testing.

- Perform the following DSKY operations:
  - VERB 01 NOUN 10 ENTR
  - 00003 ENTR

Record the indication of Row 1 and the time of day.

- Perform the following DSKY operations:
  - VERB 21 NOUN 01 ENTR
  - 01300 Row 1 indication from step 10 ENTR

13. Perform the calculations on the calculation sheet.

- Perform the following DSKY operations:
  - VERB 06 NOUN 02 ENTR
  - 01300 ENTR

Record the indication of Row 1.

- Perform the calculations on the calculation sheet.

14. Perform JDC 12613 to establish a Master Initialization condition.

**B. GENERAL G & N SYSTEM - OIA DOWN MODING FROM ISS OPERATE AND ANY G & N MODE**

- Perform the following DSKY operations:
  - VERB 41 NOUN 20 ENTR
  - Observe:
    - VERB 21 NOUN 22 Flashing ENTR
    - +00000
  - Observe:
    - NOUN 22 Flashing

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- +00000 ENTR
- Observe:
  - VERB 23 NOUN 22 Flashing ENTR
  - +09000
- Press the PROCEED/ISS STANDBY pushbutton on the Test Control panel. The PROCEED portion shall go out and the ISS STANDBY portion shall light.

**NOTE: If a lower mode than ISS Standby is desired, proceed.**

- Press the OIA ON/ISS POWER DISABLED pushbutton.
- Perform the following DSKY operations:
  - VERB 21 NOUN 01 ENTR
  - 00034 ENTR
  - 00000 ENTR
- Observe:
  - GIMBAL LOCK lamp is off
  - VERB 21 NOUN 01 ENTR
  - 00322 ENTR
  - 40000 ENTR
- Observe:
  - NO ATT lamp is off.

4. Perform the following DSKY operations:

- VERB 21 NOUN 10 ENTR

- Observe:
  - VERB 21 NOUN 10 ENTR

**NOTE: If shutting down of the test station is desired, proceed to step 6.**

- Set the Main Power switch on the G & N Coolant and Power Console to OFF.
- Set the TEST SET POWER and STATION POWER switches on the CTS to the OFF position.

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APOLLO GAN  
EQUIPMENT TEST  
DATA SHEET 1 OF 1

JOC  
NO. 12614  
REV. 2  
INITIAL TORR 2714

JOB GENERAL TURNON AND TURNOFF PROCEDURES FOR THE GAN SYSTEM

ASSEMBLY UNDER TEST				TEST HISTORY				
TITLE	DATE	START	END	SITE/LOCATION	TIME	START	END	TOTAL ELAPSED
SER. NO.	DWG	REV						
MAJOR GROUND SUPPORT EQUIPMENT								
NAME	SER. NO.	CAL DATE						
NAME	SER. NO.	CAL DATE						
CONDUCTED BY	NAME/AFFILIATION	APPROVED BY	NAME/AFFILIATION					

JOC ITEM NUMBER	RECORDED VALUES AND CALCULATIONS
8	Self test failures
10	Row 1 indication = Time of day = hours minutes
12	Row 1 indication =
13	Hours in high order scalar = $\frac{\text{line g}}{3600} \times 5.12$ = hours Time to overflow = 23.3 - line d = hours Line e converted to hours and minutes = hours minutes Time of overflow = line b + line f = hours minutes

DATE 15 MAR 66

FORM 00146  
Chg. 7-23-65





SUBSYSTEM LEM G & N SYSTEM ASSY  
DESCRIPTION Provide a Standby Control Test for Low Bus Temperature Control, 3200 Suspension Power, Master Clock Sync, +4 VDC LGC Power Supply, +14 VDC LGC Power Supply, Reticle Lamp Voltage, LGC +4 VDC Voltage Margin, and LGC +14 VDC Voltage Margin.

Rev. Let.	Date	TDRR NO.	PAGES REVISED	APPROVAL	REFERENCES
A	6-7-66	29400	JDC 1,2,3,4,7 D.S. 1,2,4	M.T. NASA M.M. ACMP	PS 6015000
					IMPORTANT
					INTERVAL
					TOOLS AND MATERIAL

INITIALIZATION

1. Insure that the LEM and G and N TEST CONF indicators on the monitor panel are lighted and that the AUX HTR PWR indicator on the Temperature Monitor Control panel is lighted.
2. Insure that the OIA ON/ISS POWER DISABLED pushbutton on the Test Control panel is lighted.
3. Press the CGC/LGC POWER ON and the 400 CPS POWER ON pushbuttons to apply power to the LGC and provide power for DSKY illumination. The pushbuttons shall light.
4. Insure the STBY Condition lamp on the DSKY is lighted. If not, perform the following DSKY operations:  
VERB 21 NOUN 10 ENTR  
00013  
VERIFICATION WITH SIDL REQUIRED BEFORE USE

02000

Press and hold the STBY pushbutton until the STBY condition lamp lights.

5. Insure the PROCEED portion of the PROCEED/ISS STANDBY pushbutton on the Test Control panel is lighted.
6. Press the PROCEED/ISS STANDBY pushbutton. The PROCEED lamp shall go out and the ISS STANDBY lamp shall light.
7. Insure the PSA HTR PWR lamp on the Temperature Monitor Control panel is lighted.
8. Observe the Monitor panel to confirm that the ERROR DETECT indicator and ALARM INHIBIT pushbuttons are not lighted.
9. Observe the Temperature Monitor Control panel to confirm that the failure lights are not lighted.

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10. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 172. Adjust the G & N POWER ADJUST on the Test Control panel until the DVM indicates 22.0 ( $\pm 1.0$ ) vdc. Record indications.
11. Set the CROSSBAR CONTROL to 156. Measure and record the instantaneous IRIG temperature deviation voltage indicated on the DVM.
12. Set the CROSSBAR CONTROL to 255. Measure and record the instantaneous PIPA temperature deviation voltage indicated on the DVM.
13. After one hour, set the CROSSBAR CONTROL to 156. Measure and record the instantaneous IRIG temperature deviation voltage indicated on the DVM.
14. Set the CROSSBAR CONTROL to 255. Measure and record the instantaneous PIPA temperature deviation voltage indicated on the DVM.
15. Calculate the difference between the IRIG and PIPA temperatures measured in steps 13 and 14.
16. Set the CROSSBAR CONTROL to 172. Adjust the G & N POWER ADJUST control on the Test Control panel until the DVM indicates 28.0 ( $\pm 1.0$ ) vdc. Record indications.
17. Set the CROSSBAR CONTROL to 120. Measure and record the voltage indicated on the DVM.

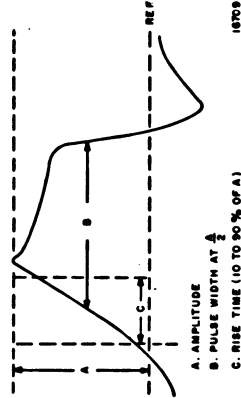
3200 SUSPENSION POWER

18. Set switches and controls on the COUNTER as follows:  
DISPLAY TIME ( $N_2$ ) to  $10^5$   
DISPLAY RESET to ZERO  
CLOCK FREQUENCY DIVIDER to 10  
CLOCK SELECTOR to INT  
FUNCTION to OFF  
INPUT SELECTOR to C SENSE  
SENSE SELECTOR to FWD  
TRIGGER VOLTAGE ATTN D to 10  
TRIGGER VOLTAGE to fully counter-clockwise  
SAMPLE TIME ( $N_1$ ) to 032000  
FUNCTION to RATIO OR PERIOD.
19. Set the COUNTER INPUT "D" SIGNAL selector on the Primary Signal Selector panel to 5. Insure that the D SIGNAL pushbutton is lighted.
20. Adjust the ATTN D selector on the Counter to the highest level that will cause triggering. Set the corresponding TRIGGER VOLTAGE control to insure that the Counter starts and subsequently stops in approximately 10 seconds. The Counter shall indicate approximately 100000.
21. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 123. Measure and record the 3200 cps 28V feed-back voltage indicated on the DVM.

MASTER CLOCK SYNC

22. Insure that the Computer Calibration Equipment console has been calibrated within the past seven days.
23. Set the Electronic Counter Controls on the Computer Calibration Equipment Console as follows:  
FUNCTION switch to FREQ.  
INPUT VOLTS RMS switch to 6  
SLOPE switch to +  
GATE switch to OPEN  
TRIGGER LEVEL switch to CENTER.
24. Set the FREQ-TIME switch on the Electronic Counter to the 100-second position (first setting from fully counterclockwise).
25. Connect cable W259 (2014470-011) P-6 to W282-P4 and P1 to Counter connector on the Control and Interface panels of the Computer Calibration Equipment console.
26. Select an INPUT VOLTS RMS switch position on the Electronic Counter where the TRIGGER LEVEL can be properly adjusted. Set the TRIGGER LEVEL to the center of the counting range. Set the GATE switch to AUTO. Insure that printer power is set to ON and the printer is in Record Mode. Read the frequency directly in CPS. Count output frequency for 15 minutes and record data from the print out of Computer Calibration Equipment Console.

27. Disconnect cable W259 (2014470-011) P-6 from the Counter connector and connect P1 to CLOCK (BNC) connector on the Interface Signals patch board on the CTS. Connect the jumper cable from the AGC CLOCK (BNC) on the Systems Interface panel of the CTS to the adjacent CLOCK (BNC) on the Interface Signals patch board.
28. Connect a jumper from the remaining CLOCK connector on the Interface Signals patchboard to either 1 MEG input channel of the Oscilloscope on the CTS.
29. Measure and record the following characteristics on the Computer Test Set Oscilloscope:  
a. Amplitude, volts peak-to-peak  
b. Width at 50% of amplitude  
c. Rise time at 10 to 90% amplitude.



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30. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 194. Measure and record the +4 VDC LGC Power Supply voltage indicated on the DVM.
31. Set the CROSSBAR CONTROL to 293. Measure and record the +14 VDC LGC Power Supply voltage indicated on the DVM.
32. Set the CROSSBAR CONTROL to 169. Measure and record the Reticle Lamp voltage when the INCR RETICLE BRIGHTNESS control on the Computer Control and Reticle Dimmer Assembly is set to the maximum and minimum brightness positions.
33. Press and hold the STBY pushbutton on the DSKY until the STBY lamp goes out.
34. Set the LGC VOLTAGE CONTROL 4V and 14V control on the CTS Power Control panel to midrange and set the 4V and 14V switches to ON.
35. Set the VOLTAGE SELECT switch to LGC 4V and adjust the 4V control for 4.0 ( $\pm 0.15$ ) vdc.

NOTE: If the control does not vary the voltage, set the 4V switch to OFF; turn the voltage control fully counterclockwise and back to midrange; set the 4V switch to ON, and then readjust.

36. Perform the following DSKY operations:  
a. RESET Press  
b. VERB 36 ENTR  
37. Set the STRT 1 and STRT 2 switches on the Buffer Circuit Assembly to ON.
38. Set the VOLTAGE SELECT switch to LGC 14V and adjust the 14V control for 14 ( $\pm 0.2$ ) vdc.

NOTE: If the control does not vary the voltage, set the 14V switch to OFF; turn the voltage control fully counterclockwise and back to midrange; set the 14V switch to ON, and then readjust.

39. Perform the following DSKY operations:  
a. VERB 57 ENTR  
b. 00015 ENTR  
c. VERB 21 NOUN 27 ENTR  
d. 77767 ENTR  
40. Set the VOLTAGE SELECT switch to LGC 4V.
41. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 194. Monitor the LGC 4 VDC voltage on the DVM.
42. Press the INHIBIT COMPUTER POWER FAIL pushbutton on the Test Control panel. The INHIBIT COMPUTER POWER FAIL lamp shall light.

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APOLLO G&N  
EQUIPMENT TEST  
DATA SHEET 1 OF 4

JDC  
NO. 12615  
REV. A  
INITIAL TDRR

JOB STANDBY CONTROL TEST

ASSEMBLY UNDER TEST				TEST HISTORY			
TITLE		DATE		START		END	
SER. NO.		DWG		REV.		TOTAL ELAPSE	
MAJOR GROUND SUPPORT EQUIPMENT							
NAME		SER. NO.		CAL DATE			
NAME		SER. NO.		CAL DATE			

CONDUCTED BY NAME/AFFILIATION APPROVED BY NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ ACC
10	Low 28 VDC IMU Standby Bus	volts	21.0		23.0	
11	IRIG Temperature Deviation Voltage	volts	-3.25		+4.0	
12	PIPA Temperature Deviation Voltage	volts	-2.5		+2.5	
13	IRIG Temperature Deviation Voltage (after one hour)	volts	-3.25	( )	+4.0	
14	PIPA Temperature Deviation Voltage (after one hour)	volts	-2.5	( )	+2.5	
15	Temp Difference (absolute)	°F	0.00		2.0	
16	28 VDC IMU Standby Bus	volts	27.0		29.0	
17	28 VDC IMU Standby Bus	volts	27.0		29.0	

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APOLLO G&N  
EQUIPMENT TEST  
DATA SHEET 2 OF 4

JDC  
NO. 12615  
REV. A

JOB STANDBY CONTROL TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ ACC
20	Counter Indication	counts	099968		100032	
21	3200 cps 28V feed-back voltage	volts	28.03		29.17	
26	CLOCK SYNC pulses Printout 1	cps	1023997		1024003	
	Printout 2	cps	1023997		1024003	
	Printout 3	cps	1023997		1024003	
	Printout 4	cps	1023997		1024003	
	Printout 5	cps	1023997		1024003	
	Printout 6	cps	1023997		1024003	
	Printout 7	cps	1023997		1024003	
	Printout 8	cps	1023997		1024003	
	Printout 9	cps	1023997		1024003	
29	Pulse Amplitude	v p-p	4.0			
	Pulse Width	μ sec	0.25		0.75	
	Pulse Rise Time	μ sec			0.2	
30	+4 VDC LGC power supply	volts	+3.85		+4.15	
31	+14 VDC LGC power supply	volts	+13.8		+14.2	
32	Maximum brightness (absolute)	v dc	4.09		4.73	
	Minimum brightness (absolute)	v dc			0.3	

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APOLLO G&N  
EQUIPMENT TEST  
DATA SHEET 3 OF 4

JDC  
NO. 12615  
REV. A

JOB STANDBY CONTROL TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ ACC
43	4V Low Margin Test	volts dc				
		R2				
		other fail indications				
47	4V Voltage Fail Alarm (low)	volts dc	3.55		3.65	
51	4V High Margin Test	volts dc				
		R2				
		other fail indications				
55	4V Voltage Fail Alarm (high)	volts dc	4.3		4.7	
59	14V Low Margin Test	volts dc				
		R2				
		other fail indications				
63	14V Voltage Fail Alarm (low)	volts dc	12.4		12.8	
67	14V High Margin Test	volts dc				
		R2				
		other fail indications				

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APOLLO G&N  
EQUIPMENT TEST  
DATA SHEET 4 OF 4

JDC  
NO. 12615  
REV. A

JOB STANDBY CONTROL TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ ACC
71	14V Voltage Fail Test	volts dc	16.0		16.4	
JDC ITEM NO.	CALCULATIONS					
15	IRIG TEMP = Nominal IRIG TEMP + Deviation					
	Nominal IRIG TEMP indicating set point.					
	Deviation (step 13 x 2 deg/volt)					
	IRIG TEMP (line a + Line b)					
	PIPA TEMP = Nominal PIPA Temp + Deviation					
	Nominal PIPA TEMP indicating set point.					
	Deviation (Step 14 x 2 deg/volt)					
	PIPA TEMP (line d + Line e)					
	Temp Difference = IRIG TEMP - PIPA TEMP = Line c - Line f					
	Line e					
	Line f					
	Temp Difference (Absolute)					

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SUBSYSTEM LEM G & N SYSTEM  
DESCRIPTION Provide a Standby Control Test for Low Bus Temperature Control, 3200 Suspension Power, Master Clock Sync, +14 VDC LGC Power Supply, +14 VDC LGC Power Supply, Reticle Lamp Voltage, LGC +4 VDC Voltage Margin, and LGC +14 VDC Voltage Margin.

Rev. Let.	Date	TORR NO.	PAGES REVISED	APPROVAL	REFERENCES
A	6-7-66	29100	JDC 1.2, 3.4, 7	MIL D.S. 1.2, 4	PS 6015000
B	7-21-66	30271	1.2, 5	MMB EA MBZ	
					IMPORTANT
					INTERVAL
					TOOLS AND MATERIAL

INITIALIZATION  
1. Insure that the LEM and G and N TEST CONF indicators on the monitor panel are lighted and that the AUX HTR PWR Indicator on the Temperature Monitor Control panel is lighted.  
2. Insure that the OIA ON/ISS POWER DISABLED pushbutton on the Test Control panel is lighted.  
3. Press the CGC/LGC POWER ON and the 400 CPS POWER ON pushbuttons to apply power to the LGC and provide power for DSKY illumination. The pushbuttons shall light.  
4. Insure the STBY Condition lamp on the DSKY is lighted. If not, perform the following DSKY operations:  
VERB 21 NOUN 10 ENTR  
00013  
ENTR  
VERIFICATION WITH SCL REQUIRED BEFORE USE

02000 ENTR  
Press and hold the STBY pushbutton until the STBY condition lamp lights.  
5. Insure the PROCEED portion of the PROCEED/ISS STANDBY pushbutton on the Test Control panel is lighted.  
6. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 172. Adjust the G & N POWER ADJUST on the Test Control panel until the DVM indicates 22.0 ( $\pm 1.0$ ) vdc. Record indications.  
7. Set up the Oscilloscope as follows:  
a. Set CHANNELS 3 and 4 of the Oscilloscope Signal Selector panel to monitor the following signals:  
1. PIPA Standby Temperature deviation CHANNEL 3-3 DC.

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LOW BUS TEMPERATURE CONTROL  
11. Observe the Monitor panel to confirm that the ERROR DETECT indicator and ALARM INHIBIT pushbuttons are not lighted.  
12. Observe the Temperature Monitor Control panel to confirm that the failure lights are not lighted.  
13. After one hour has elapsed since performing step 9, press the EVENT MARKER on the Oscilloscope Control panel and stop the Oscilloscope.  
14. Determine from the Oscilloscope chart and by use of the calculation sheet, the mean temperature of the IRIG's and PIPA's during the one hour period. Record results.  
15. Calculate and record the difference between the IRIG and PIPA temperatures determined in step 14.  
16. Set the CROSSBAR CONTROL to 172. Adjust the G & N POWER ADJUST control on the Test Control panel until the DVM indicates 28.0 ( $\pm 1.0$ ) vdc. Record indications.  
28 VDC IMU STANDBY BUS  
17. Set the CROSSBAR CONTROL to 120. Measure and record the voltage indicated on the DVM.

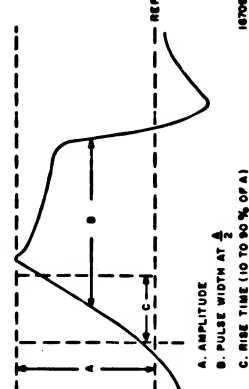
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3200 SUSPENSION POWER  
18. Set switches and controls on the COUNTER as follows:  
DISPLAY TIME (N<sub>2</sub>) to 10<sup>5</sup>  
DISPLAY RESET to ZERO  
CLOCK FREQUENCY DIVIDER to 10  
CLOCK SELECTOR to INT  
FUNCTION to OFF  
INPUT SELECTOR to C SENSE  
SENSE SELECTOR to FWD  
TRIGGER VOLTAGE ATTN D to 10  
TRIGGER VOLTAGE to fully counter-clockwise  
SAMPLE TIME (N<sub>1</sub>) to 032000  
FUNCTION to RATIO OR PERIOD.  
19. Set the COUNTER INPUT "D" SIGNAL selector on the Primary Signal Selector panel to 5. Insure that the D SIGNAL pushbutton is lighted.  
20. Adjust the ATTN D selector on the Counter to the highest level that will cause triggering. Set the corresponding TRIGGER VOLTAGE control to insure that the Counter starts and subsequently stops in approximately 10 seconds. The Counter shall indicate approximately 100000.  
Record the Counter indication.  
21. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 123. Measure and record the 3200 cps 28V feedback voltage indicated on the DVM.

MASTER CLOCK SYNC  
22. Insure that the Computer Calibration Equipment console has been calibrated within the past seven days.  
23. Set the Electronic Counter Controls on the Computer Calibration Equipment Console as follows:  
FUNCTION switch to FREQ.  
INPUT VOLTS RMS switch to 6  
SLOPE switch to +  
GATE switch to OPEN  
TRIGGER LEVEL switch to CENTER.  
24. Set the FREQ-TIME switch on the Electronic Counter to the 100-second position (first setting from fully counterclockwise).  
25. Connect cable W259 (2014470-011) P-6 to W232-P4 and P1 to Counter connector on the Control and Interface panels of the Computer Calibration Equipment console.  
26. Select an INPUT VOLTS RMS switch position on the Electronic Counter where the TRIGGER LEVEL can be properly adjusted. Set the TRIGGER LEVEL to the center of the counting range. Set the GATE switch to AUTO. Insure that printer power is set to ON and the printer is in Record Mode. Record the frequency directly in CPS. Count output frequency for 15 minutes and record data from the print out of Computer Calibration

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+4 VDC LGC POWER SUPPLY  
30. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 194. Measure and record the +4 VDC LGC Power Supply voltage indicated on the DVM.  
+14 VDC LGC POWER SUPPLY  
31. Set the CROSSBAR CONTROL to 283. Measure and record the +14 VDC LGC Power Supply voltage indicated on the DVM.  
RETICLE LAMP VOLTAGE  
32. Set the CROSSBAR CONTROL to 169. Measure and record the Reticle Lamp voltage when the INCR RETICLE BRIGHTNESS Dimmer Assembly is set to the maximum and minimum brightness positions.  
33. Press and hold the STBY pushbutton on the DSKY until the STBY lamp goes out.  
34. Set the LGC VOLTAGE CONTROL 4V and 14V control on the CTS Power Control panel to midrange and set the 4V and 14V switches to ON.  
35. Set the VOLTAGE SELECT switch to LGC 4V and adjust the 4V control for 4.0 ( $\pm 0.15$ ) vdc.



NOTE: If the control does not vary the voltage, set the 4V switch to OFF; turn the voltage control fully counterclockwise and back to midrange; set the 4V switch to ON, and then readjust.

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SUBSYSTEM	LEM G & N SYSTEM	ASSY
36.	Perform the following DSKY operations:	a. Press and hold the STBY pushbutton until the pushbutton goes out. b. RESET Press c. VERB 61 ENTR d. VERB 36 ENTR
37.	Set the STRT 1 and STRT 2 switches on the Buffer Circuit Assembly to ON.	
38.	Set the VOLTAGE SELECT switch to LGC 14V and adjust the 14V control for 14 ( $\pm 0.2$ ) vdc.	44. Set the STRT 1 and STRT 2 switches on the Buffer Circuit Assembly to ON. 45. Set the AGC VOLTAGE 1 and 2 controls on the CTS Power Control panel to midrange and set the CONTROL 1 and CONTROL 2 switches to ON. 46. Set the VOLTAGE SELECT switch to CGC 4V and adjust the CONTROL 1 for 4.0 ( $\pm 0.15$ ) vdc. NOTE: If the control does not vary the voltage, set the 14V switch to OFF; turn the voltage control fully counterclockwise and back to midrange; set the 14V switch to ON, and then readjust.
39.	Perform the following DSKY operations:	a. VERB 57 ENTR b. 00015 ENTR c. VERB 21 NOUN 27 ENTR d. 77767 ENTR
40.	Set the VOLTAGE SELECT switch to LGC 4V.	47. Set the VOLTAGE SELECT switch to CGC 14V and adjust the CONTROL 2 for 14 ( $\pm 0.2$ ) vdc. NOTE: If the control does not vary the voltage, set the CONTROL 2 switch to OFF; turn CONTROL 2 fully counterclockwise and back to midrange; set the CONTROL 2 switch to ON, and then readjust.
41.	Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 194. Monitor the LGC 4 VDC voltage on the DVM.	
42.	Press the INHIBIT COMPUTER POWER FAIL pushbutton on the Test Control panel. The INHIBIT COMPUTER POWER FAIL lamp shall light.	
43.	Perform the following MAIN DSKY operations:	

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SUBSYSTEM	LEM G & N SYSTEM	ASSY
48.	Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 194. Monitor the +4 VDC CGC power supply voltage indicated on the DVM. Turn on the Inhibit Power Fail Signal.	Warning shall occur. (Other failures may also occur but are to be ignored). Return the 4 & 14 volt supplies to nominal values after each of the above steps and press the RESET button on the DSKY. All alarms shall go out within 60 seconds.
49.	Using CONTROL 1 adjust the CTC 4 VDC supply voltage to 3.60 VDC using CONTROL 2, adjust the CTC 14 VDC supply to 12.6 VDC and to 16.2 VDC. Use CONTROL again to adjust the 4 volt supply to 4.5 volts. Use CONTROL 2 to adjust the 14 volt supply to 12.6 volts and then 16.2 volts. No computer failures shall occur.	51. Set CONTROL 1 and CONTROL 2 switches to OFF. 52. Upon completion of the data sheets, make copies of the data sheets and forward one set each immediately to: Digital Development Group MSS5 Instrumentation Laboratory 75 Cambridge Parkway Cambridge, Mass. 02142 and IMU Thermo Design Group MS99 Instrumentation Laboratory 75 Cambridge Parkway Cambridge, Massachusetts 02142
50.	Turn the Inhibit Power Fail Signal OFF. Using CONTROL 1 and CONTROL 2 set the computer 4 and 14 volt supplies to the following points.	
	a. 3.5v & 14.0v b. 4.5v & 14.0v c. 4.0v & 16.5v d. 4.0v & 12.6v	
	at each of points a, b, c, & d an LGC	

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APOLLO G&N  
EQUIPMENT TEST

DATA SHEET 1 OF 3

JDC  
NO. 12615  
REV. B  
INITIAL TDRR 30271

JOB STANDBY CONTROL TEST

ASSEMBLY UNDER TEST			TEST HISTORY			
SER. NO.	DWG	REV	DATE	START	END	SITE / LOCAT ON
			TIME	START	END	TOTAL ELAPSED
MAJOR GROUND SUPPORT EQUIPMENT						
CONDUCTED BY			APPROVED BY			
NAME / AFFILIATION			NAME / AFFILIATION			
JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ ACC
6	Low 28 VDC IMU Standby Bus	volts	21.0		23.0	
14	Mean PIPA temp (one hour)	° F	129.0		132.0	
	Mean IRIG temp (one hour)	° F				
15	Mean Temperature Difference (absolute)	° F	0.0		2.0	
16	28 VDC IMU Standby Bus	volts	27.0		29.0	
17	28 VDC IMU Standby Bus	volts	27.0		29.0	

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APOLLO G&N  
EQUIPMENT TEST

DATA SHEET 2 OF 3

JDC  
NO. 12615  
REV. B

JOB STANDBY CONTROL TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ ACC
20	Counter Indication	counts	099968		100032	
21	3200 cps 28V feed-back voltage	volts	28.03		28.17	
26	CLOCK SYNC pulses Printout 1	cps	1023997		1024003	
	Printout 2	cps	1023997		1024003	
	Printout 3	cps	1023997		1024003	
	Printout 4	cps	1023997		1024003	
	Printout 5	cps	1023997		1024003	
	Printout 6	cps	1023997		1024003	
	Printout 7	cps	1023997		1024003	
	Printout 8	cps	1023997		1024003	
	Printout 9	cps	1023997		1024003	
29	Pulse Amplitude	v-p	4.0			
	Pulse Width	μsec	0.25		0.75	
	Pulse Rise Time	μsec			0.2	
30	+4 VDC LGC power supply	volts	+3.85		+4.15	
31	+14 VDC LGC power supply	volts	+13.8		+14.2	
32	Maximum brightness (absolute)	v dc	4.09		4.73	
	Minimum brightness (absolute)	v dc			0.3	

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APOLLO 68N  
EQUIPMENT TEST  
DATA SHEET 3 OF 3

JDC  
NO. 12615  
REV. 1

JOB STANDBY CONTROL TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ. ACC
49	No Fail Alarms					
50	Fail Alarms					
CALCULATIONS						
14	MEAN PIPA TEMP = Nominal PIPA TEMP + Deviation of Mean Nominal PIPA TEMP Indicating set point (Chart zero) 130.00 degrees					
Deviation of PIPA Mean.						
(±) No. MM (Between PIPA Mean & chart zero) $\frac{0.02V}{MM} \times \frac{2''}{V} = (\pm)$						
MEAN PIPA TEMP (line a + line b)						
MEAN IRIG TEMP = Nominal IRIG TEMP + Deviation of MEAN Nominal IRIG TEMP Indicating set point (Chart zero) 135.00 degree						
Deviation of IRIG Mean						
(±) No. MM (Between IRIG MEAN & Chart Zero) $\frac{0.02V}{MM} \times \frac{2''}{V} = (\pm)$						
MEAN IRIG TEMP (line d + line f)						
15	Temp Difference = IRIG TEMP-PIPA TEMP = line of - line c					
Line f						
Line c						
Temp Difference (absolute)						

DATE 15 MAR 68







JOBSTANDBY CONTROL TESTJDC 12615 REV C PAGE 5 OF 6

SUBSYSTEMLEM G & N SYSTEM

ASSY

36. Perform the following DSKY operations:

a. RESETPress

b. VERB 36ENTR

c. VERB 61ENTR

d. VERB 36ENTR

37. Set the STRT 1 and STRT 2 switches on the Buffer Circuit Assembly to ON.

38. Set the VOLTAGE SELECT switch to LGC 14V and adjust the 14V control for 14 (+0.2) vdc.

NOTE: If the control does not vary the voltage, set the 14V switch to OFF; turn the voltage control fully counterclockwise and back to midrange; set the 14V switch to ON, and then readjust.

39. Perform the following DSKY operations:

a. VERB 57ENTR

b. 00015ENTR

c. VERB 21 NOUN 27ENTR

d. 77767ENTR

40. Set the VOLTAGE SELECT switch to LGC 4V.

NOTE: If the control does not vary the voltage, set the CONTROL 2 switch to OFF; turn CONTROL 2 fully counterclockwise and back to midrange; set the CONTROL 2 switch to ON, and then readjust.

41. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 194. Monitor the LGC 4 VDC voltage on the DVM.

42. Press the INHIBIT COMPUTER POWER FAIL pushbutton on the Test Control panel. The INHIBIT COMPUTER POWER FAIL lamp shall light.

CGC VOLTAGE MARGIN TEST

43. Perform the following MAIN DSKY operations:

a. Press and hold the STBY pushbutton until the pushbutton goes out.

b. RESETPress

c. VERB 61ENTR

d. VERB 36ENTR

44. Set the STRT 1 and STRT 2 switches on the Buffer Circuit Assembly to ON.

45. Set the AGC VOLTAGE 1 and 2 controls on the CTS Power Control panel to midrange and set the CONTROL 1 and CONTROL 2 switches to ON.

46. Set the VOLTAGE SELECT switch to CGC 4V and adjust the CONTROL 1 for 4.0 (+0.15) vdc.

NOTE: If the control does not vary the voltage, set the CONTROL 1 switch OFF; turn CONTROL 1 fully counterclockwise and back to midrange; set the CONTROL 1 switch to ON, and then readjust.

47. Set the VOLTAGE SELECT switch to CGC 14V and adjust the CONTROL 2 for 14 (+0.2) vdc.

NOTE: If the control does not vary the voltage, set the CONTROL 2 switch to OFF; turn CONTROL 2 fully counterclockwise and back to midrange; set the CONTROL 2 switch to ON, and then readjust.

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APOLLO G&N  
EQUIPMENT TEST  
DATA SHEET 1 OF 3

JDC  
NO. 12615  
REV. C  
INITIAL TDRR 30271

JOBSTANDBY CONTROL TEST

ASSEMBLY UNDER TEST

TEST HISTORY

SER. NO. \_\_\_\_\_ DWG. \_\_\_\_\_ REV. \_\_\_\_\_

DATE \_\_\_\_\_ START \_\_\_\_\_ END \_\_\_\_\_ SITE / LOCATION \_\_\_\_\_

TIME \_\_\_\_\_ START \_\_\_\_\_ END \_\_\_\_\_ TOTAL ELAPSED \_\_\_\_\_

MAJOR GROUND SUPPORT EQUIPMENT

NAME \_\_\_\_\_ SER. NO. \_\_\_\_\_ CAL DATE \_\_\_\_\_

NAME \_\_\_\_\_ SER. NO. \_\_\_\_\_ CAL DATE \_\_\_\_\_

CONDUCTED BY \_\_\_\_\_ NAME/AFFILIATION \_\_\_\_\_

APPROVED BY \_\_\_\_\_ NAME/AFFILIATION \_\_\_\_\_

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ ACC
6	Low 28 VDC IMU Standby Bus	volts	21.0		23.0	
14	Mean PIPA temp (one hour)	° F	129.0		132.0	
	Mean IRIG temp (one hour)	° F				
15	Mean Temperature Difference (absolute)	° F	0.0		2.0	
16	28 VDC IMU Standby Bus	volts	27.0		29.0	
17	28 VDC IMU Standby Bus	volts	27.0		29.0	

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JOBSTANDBY CONTROL TESTJDC 12615 REV C PAGE 6 OF 6

SUBSYSTEMLEM G & N SYSTEM

ASSY

48. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 194. Monitor the +4 VDC CGC power supply voltage indicated on the DVM. Turn on the Inhibit Power Fail Signal.

49. Using CONTROL 1 adjust the CTC 4 VDC supply voltage to 3.60 VDC using CONTROL 2, adjust the CTC 14 VDC supply to 12.6 VDC and to 16.2 VDC. Use CONTROL again to adjust the 4 volt supply to 14 volt supply to 12.6 volts and then 16.2 volts. No computer failures shall occur.

50. Turn the Inhibit Power Fail Signal OFF. Using CONTROL 1 and CONTROL 2 set the computer 4 and 14 volt supplies to the following points.

a. 3.5v & 14.0v

b. 4.5v & 14.0v

c. 4.0v & 16.5v

d. 4.0v & 12.6v

at each of points a, b, c, & d an LGC

Warning shall occur. (Other failures may also occur but are to be ignored). Return the 4 & 14 volt supplies to nominal values after each of the above steps and press the RESET button on the DSKY. All alarms shall go out within 60 seconds.

51. Set CONTROL 1 and CONTROL 2 switches to OFF.

52. Upon completion of the data sheets, make copies of the data sheets and forward one set each immediately to:

Digital Development Group

MS35

Instrumentation Laboratory

75 Cambridge Parkway

Cambridge, Mass. 02142

and

IMU Thermo Design Group

MS99

Instrumentation Laboratory

75 Cambridge Parkway

Cambridge, Massachusetts

02142

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APOLLO G&N  
EQUIPMENT TEST  
DATA SHEET 2 OF 3

JDC  
NO. 12615  
REV. C

JOBSTANDBY CONTROL TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ ACC
20	Counter Indication	counts	099968		100032	
21	3200 cps 28V feed-back voltage	volts	28.03		29.17	
26	CLOCK SYNC pulses Printout 1	cps	1023997		1024003	
	Printout 2	cps	1023997		1024003	
	Printout 3	cps	1023997		1024003	
	Printout 4	cps	1023997		1024003	
	Printout 5	cps	1023997		1024003	
	Printout 6	cps	1023997		1024003	
	Printout 7	cps	1023997		1024003	
	Printout 8	cps	1023997		1024003	
	Printout 9	cps	1023997		1024003	
29	Pulse Amplitude	v p-p	4.0			
	Pulse Width	µ sec	0.25		0.75	
	Pulse Rise Time	µ sec			0.2	
30	+4 VDC LGC power supply	volts	+3.85		+4.15	
31	+14 VDC LGC power supply	volts	+13.8		+14.2	
32	Maximum brightness (absolute)	v dc	4.09		4.73	
	Minimum brightness (absolute)	v dc			0.3	

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APOLLO G8N  
EQUIPMENT TEST  
DATA SHEET 3 OF 3

JDC  
NO. 12615  
REV. C

JOB STANDBY CONTROL TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ ACC
49	No Fail Alarms					
50	Fail Alarms					
CALCULATIONS						
14	MEAN PIPA TEMP = Nominal PIPA TEMP + Deviation of Mean					
	Nominal PIPA TEMP indicating set point (Chart zero) 130.00 degrees					
	Deviation of PIPA Mean.					
	$(\pm) \text{ No. MM (Between PIPA Mean \& chart zero)} \times \frac{0.05V}{MM} \times \frac{2^\circ}{V} = (\pm) \text{ }^\circ$					
	MEAN PIPA TEMP (line a + line b) $\text{ }^\circ$					
	MEAN IRIG TEMP = Nominal IRIG TEMP + Deviation of MEAN					
	Nominal IRIG TEMP indicating set point (chart zero) 135.00 degrees					
15	Deviation of IRIG Mean					
	$\pm \text{ No. MM (Between IRIG MEAN \& Chart Zero)} \times \frac{0.10V}{MM} \times \frac{2^\circ}{V} = \pm (\pm) \text{ }^\circ$					
	MEAN IRIG TEMP (line d + line e) $\text{ }^\circ$					
	Temp Difference = IRIG TEMP-PIPA TEMP					
	= line f - line c					
	Line f $\text{ }^\circ$					
	Line c $\text{ }^\circ$					
Temp Difference (absolute) $\text{ }^\circ$						

DATE 15 MAR 66

SUBSYSTEM LEM G & N SYSTEM  
DESCRIPTION Provide a Standby Control Test for Low Bus Temperature Control, 3200 Suspension Power, Master Clock Sync, +4 VDC LGC Power Supply, +14 VDC LGC Power Supply, Reticle Lamp Voltage, LGC +4 VDC Voltage Margin, and LGC +14 VDC Voltage Margin.

Rev.	Let.	Date	TDOR NO.	PAGES REVISED	APPROVAL	REFERENCES
A	6-7-66	29400	1,2,3,4,7	1,2,4	MUT NASA	PS 6015000
B	7-21-66	30271	1,2,5	1,3,4	MM ACN	
C	8-4-66	30517	1,2	4	EA MB	IMPORTANT
D	11-10-66	31901	2,3,4,6	2,3	EA	
						INTERVAL
						TOOLS AND MATERIAL

INITIALIZATION	ENTR
1. Insure that the LEM and G and N TEST CONF indicators on the monitor panel are lighted and that the AUX HTR PWR indicator on the Temperature Monitor Control panel is lighted.	Press and hold the STBY pushbutton until the STBY condition lamp lights.
2. Insure that the OIA ON/ISS POWER DISABLED pushbutton on the Test Control panel is lighted.	5. Insure the PROCEED portion of the PROCEED/ISS STANDBY pushbutton on the Test Control panel is lighted.
3. Press the CGC/LGC POWER ON and the 400 CPS POWER ON pushbuttons to apply power to the LGC and provide power for DSKY illumination. The pushbuttons shall light.	6. Set up the Oscillograph as follows: a. Set CHANNELS 3 and 4 of the Oscillograph Signal Selector panel to monitor the following signals: 1. PIPA Standby Temperature deviation CHANNEL 3-3 DC. 2. IRIG Standby Temperature deviation CHANNEL 4-3 DC.
4. Insure the STBY Condition lamp on the DSKY is lighted. If not, perform the following DSKY operations: VERB 21 NOUN 10 ENTR 00013	b. Insure that the CHANNEL 3-3 DC and CHANNEL 4-4 DC pushbuttons on the Oscillograph Signal Selector panel are lighted.
	ENTR VERIFICATION WITH SIDL REQUIRED BEFORE USE
	DATE 15 MAR 66

- ASSY
- c. Zero and calibrate CHANNELS 3 and 4 on the Oscillograph Amplifier, setting the CHART SPEEDS to 1 and the Range to 0.050 V/MM on the Oscillograph control for CHANNEL 3 and 0.2 V/MM on the Oscillograph control for CHANNEL 4.
- d. Mark the Oscillograph Channels as follows:
- CHANNEL 3 "start of Standby PIPA TEMP test."
  - CHANNEL 4 "start of Standby IRIG TEMP test."
7. Start the oscillograph by setting the CHART DRIVE switch to MM/SEC.
8. Press the PROCEED/ISS STANDBY pushbutton. The PROCEED lamp shall go out and the ISS STANDBY lamp shall light. Immediately press the EVENT MARKER on the Oscillograph Control panel.
9. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 172. Adjust the G & N POWER ADJUST on the Test Control Panel until the DVM indicates 22.0 ( $\pm 1.0$ ) vdc. Record indications.
10. Insure that the PSA HTR lamp on the Temperature Monitor Control Panel is lighted.
- ASSY
11. Observe the Monitor panel to confirm that the ERROR DETECT indicator and ALARM INHIBIT pushbuttons are not lighted.
12. Observe the Temperature Monitor Control panel to confirm that the failure lights are not lighted.
13. After one hour has elapsed since performing step 9, press the EVENT MARKER on the Oscillograph Control panel and stop the Oscillograph.
14. Determine from the Oscillograph chart and by use of the calculation sheet, the mean temperature of the IRIG's and PIPA's during the one hour period. Record results.
15. Calculate and record the difference between the IRIG and PIPA temperatures determined in step 14.
16. Set the CROSSBAR CONTROL to 172. Adjust the G & N POWER ADJUST control on the Test Control panel until the DVM indicates 28.0 ( $\pm 1.0$ ) vdc. Record indications.
- 28 VDC IMU STANDBY BUS
17. Set the CROSSBAR CONTROL to 120. Measure and record the voltage indicated on the DVM.

DATE 15 MAR 66

- ASSY
18. Set switches and controls on the COUNTER as follows:
- DISPLAY TIME (N<sub>2</sub>) to 10<sup>5</sup>
  - DISPLAY RESET to ZERO
  - CLOCK FREQUENCY DIVIDER to 10
  - CLOCK SELECTOR to INT
  - FUNCTION to OFF
  - INPUT SELECTOR to C SENSE
  - SENSE SELECTOR to FWD
  - TRIGGER VOLTAGE ATTN D to 10
  - TRIGGER VOLTAGE to fully counter-clockwise
  - SAMPLE TIME (N<sub>1</sub>) to 032000
  - FUNCTION to RATIO OR PERIOD.
19. Set the COUNTER INPUT "D" SIGNAL selector on the Primary Signal Selector panel to 5. Insure that the D SIGNAL pushbutton is lighted.
20. Adjust the ATTN D selector on the Counter to the highest level that will cause triggering. Set the corresponding TRIGGER VOLTAGE control to insure that the Counter starts and subsequently stops in approximately 10 seconds. The Counter shall indicate approximately 100000.
- Record the Counter indication.
21. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 123. Measure and record the 3200 cps 28V feed-back voltage indicated on the DVM.
- MASTER CLOCK SYNC
22. Insure that the Computer Calibration Equipment console has been calibrated within the past seven days.
- ASSY
23. Set the Electronic Counter Controls on the Computer Calibration Equipment Console as follows:
- FUNCTION switch to FREQ.
  - INPUT VOLTS RMS switch to 6
  - SLOPE switch to +
  - GATE switch to OPEN
  - TRIGGER LEVEL switch to CENTER.
24. Set the FREQ-TIME switch on the Electronic Counter to the 100-second position (first setting from fully counterclockwise).
25. Connect cable W259 (2014470-011) P-6 to W232-P4 and P1 to Counter connector on the Control and Interface panels of the Computer Calibration Equipment console. Connect P4 and P5 of cable W259 to J7 and J8 on Buffer Assembly, connect P2 and P3 of cable W256 to SIGNAL HI and SIGNAL LO on Digital Ohmmeter.
26. Select an INPUT VOLTS RMS switch position on the Electronic Counter where the TRIGGER LEVEL can be properly adjusted. Set the TRIGGER LEVEL to the center of the counting range. Set the GATE switch to AUTO. Insure that printer power is set to ON and the printer is in Record Mode. Read the frequency directly in CPS. Count output frequency for 15 minutes and record data from the print out of Computer Calibration

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- ASSY
- +14 VDC LGC POWER SUPPLY
31. Set the CROSSBAR CONTROL to 293. Measure and record the +14 VDC LGC Power Supply voltage indicated on the DVM.
- RETICLE LAMP VOLTAGE
32. Set the CROSSBAR CONTROL to 169. Measure and record the Reticle Lamp voltage when the INCR RETICLE BRIGHTNESS control on the Computer Control and Reticle Dimmer Assembly is set to the maximum and minimum brightness positions.
33. Press and hold the STBY pushbutton on the DSKY until the STBY lamp goes out.
34. Set the LGC VOLTAGE CONTROL 4V and 14V control on the CTS Power Control panel to midrange and set the 4V and 14V switches to ON.
35. Set the VOLTAGE SELECT switch to LGC 4V and adjust the 4V control for 4.0 ( $\pm 0.15$ ) vdc.
- NOTE: If the control does not vary the voltage, set the 4V switch to OFF; turn the voltage control fully counterclockwise and back to midrange; set the 4V switch to ON, and then readjust.
- Equipment Console.
27. Disconnect cable W259 P6 from the Counter connector and connect it directly to the vertical input of the Oscilloscope.
28. Deleted.
29. Measure and record the following characteristics on the Computer Test Set Oscilloscope:
- a. Amplitude, volts peak-to-peak
  - b. Width at 50% of amplitude
  - c. Rise time at 10 to 90% amplitude.
- 
- +4 VDC LGC POWER SUPPLY
30. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 194. Measure and record the +4 VDC LGC Power Supply voltage indicated on the DVM.

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SUBSYSTEM LEM G & N SYSTEM

ASSY

36. Perform the following DSKY operations:

a. RESET Press

b. VERB 36 ENTR

37. Set the STRT 1 and STRT 2 switches on the Buffer Circuit Assembly to ON.

38. Set the VOLTAGE SELECT switch to LGC 14V and adjust the 14V control for 14 (+0.2) vdc.

NOTE: If the control does not vary the voltage, set the 14V switch to OFF; turn the voltage control fully counterclockwise and back to midrange; set the 14V switch to ON, and then readjust.

39. Perform the following DSKY operations:

a. VERB 57 ENTR

b. 00015 ENTR

c. VERB 21 NOUN 27 ENTR

d. 77767 ENTR

40. Set the VOLTAGE SELECT switch to LGC 4V.

41. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 194. Monitor the LGC 4 VDC voltage on the DVM.

42. Press the INHIBIT COMPUTER POWER FAIL pushbutton on the Test Control panel. The INHIBIT COMPUTER POWER FAIL lamp shall light.

CGC VOLTAGE MARGIN TEST

43. Perform the following MAIN DSKY operations:

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APOLLO G&N EQUIPMENT TEST DATA SHEET 1 OF 3

JDC NO. 12615 JDC REV. D INITIAL TDRR 30271

JOB STANDBY CONTROL TEST

ASSEMBLY UNDER TEST

TEST HISTORY

SER. NO. \_\_\_\_\_ DATE \_\_\_\_\_ START \_\_\_\_\_ END \_\_\_\_\_ SITE / LOCATION \_\_\_\_\_

TIME \_\_\_\_\_ START \_\_\_\_\_ END \_\_\_\_\_ TOTAL ELAPSED \_\_\_\_\_

NAME \_\_\_\_\_ SER. NO. \_\_\_\_\_ CAL. DATE \_\_\_\_\_

NAME \_\_\_\_\_ SER. NO. \_\_\_\_\_ CAL. DATE \_\_\_\_\_

CONDUCTED BY \_\_\_\_\_ APPROVED BY \_\_\_\_\_ NAME / AFFILIATION \_\_\_\_\_

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ ACC
6	Low 28 VDC IMU Standby Bus	volts	21.0		23.0	
14	Mean PIPA temp (one hour)	° F	129.0		132.0	
	Mean IRIG temp (one hour)	° F				
15	Mean Temperature Difference (absolute)	° F	0.0		2.0	
16	28 VDC IMU Standby Bus	volts	27.0		29.0	
17	28 VDC IMU Standby Bus	volts	27.0		29.0	

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JOB STANDBY CONTROL TEST JDC 12615 REV D PAGE 6 OF 6

SUBSYSTEM LEM G & N SYSTEM

ASSY

48. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 194. Monitor the +4 VDC CGC power supply voltage indicated on the DVM. Turn on the Inhibit Power Fail Signal.

49. Using CONTROL 1 adjust the CTC 4 VDC supply voltage to 3.60 VDC using CONTROL 2, adjust the CTC 14 VDC supply to 12.6 VDC and to 16.2 VDC. Use CONTROL again to adjust the 4 volt supply to 4.5 volts. Use CONTROL 2 to adjust the 14 volt supply to 12.6 volts and then 16.2 volts. No computer failures shall occur.

50. Adjust CONTROL 1 to set 4 volt supply to 4.0 VDC and adjust CONTROL 2 to set 14 volt supply to 14.0 VDC. Turn the Inhibit Power Fail Signal OFF. Using CONTROL 1 and CONTROL 2 set the computer 4 and 14 volt supplies to the following points.

a. 3.5v & 14.0v

b. 4.5v & 14.0v

c. 4.0v & 16.5v

d. 4.0v & 12.6v

at each of points a, b, c, & d an LGC

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APOLLO G&N EQUIPMENT TEST DATA SHEET 2 OF 3

JDC NO. 12615 JDC REV. D

JOB STANDBY CONTROL TEST

JDC ITEM NO.

PARAMETER

UNITS

MIN VALUE

RECORDED VALUE

MAX VALUE

REJ ACC

20	Counter Indication	counts	099968		100032	
21	3200 cps 28V feed-back voltage	volts	28.03		29.17	
26	CLOCK SYNC pulses Printout 1	cps	1023997		1024003	
	Printout 2	cps	XXXX2399700		XXXX2400300	
	Printout 3	cps	XXXX2399700		XXXX2400300	
	Printout 4	cps	XXXX2399700		XXXX2400300	
	Printout 5	cps	XXXX2399700		XXXX2400300	
	Printout 6	cps	XXXX2399700		XXXX2400300	
	Printout 7	cps	XXXX2399700		XXXX2400300	
	Printout 8	cps	XXXX2399700		XXXX2400300	
	Printout 9	cps	XXXX2399700		XXXX2400300	
29	Pulse Amplitude	vp-p	4.0			
	Pulse Width	μsec	0.25		0.75	
	Pulse Rise Time	μsec			0.2	
30	+4 VDC LGC power supply	volts	+3.85		+4.15	
31	+14 VDC LGC power supply	volts	+13.8		+14.2	
32	Maximum brightness (absolute)	v dc	4.09		4.73	
	Minimum brightness (absolute)	v dc			0.3	

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APOLLO G&N  
EQUIPMENT TEST  
DATA SHEET 3 OF 3

JDC  
NO. 12615  
REV. D

JOB STANDBY CONTROL TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ ACC
49	No Fail Alarms					
50	Fail Alarms					
CALCULATIONS						
14	MEAN PIPA TEMP = Nominal PIPA TEMP + Deviation of Mean					
	Nominal PIPA TEMP Indicating set point (Chart zero) 130.00 degrees					
	Deviation of PIPA Mean.					
	(+/-) No. MM (Between PIPA Mean & chart zero) $\frac{0.05V}{MM} \times \frac{2^\circ}{V} = (+/-)$ °					
	MEAN PIPA TEMP (line a + line b) _____ °					
	MEAN IRIG TEMP = Nominal IRIG TEMP + Deviation of MEAN					
	Nominal IRIG TEMP Indicating set point (chart zero) 135.00 degrees					
15	Deviation of IRIG Mean					
	± No. MM (Between IRIG MEAN & Chart Zero) $\frac{0.2V}{MM} \times \frac{2^\circ}{V} = + (-)$ °					
	MEAN IRIG TEMP (line d + line e) _____ °					
	Temp Difference = IRIG TEMP-PIPA TEMP					
	= line f - line c					
	Line f _____ °					
	Line c _____ °					
Temp Difference (absolute) _____ °						

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SUBSYSTEM LEM G & N SYSTEM  
DESCRIPTION Provide a Standby Control Test for Low Bus Temperature Control, 3200 Suspension Power, Master Clock Sync, +4 VDC LGC Power Supply, +14 VDC LGC Power Supply, Reticle Lamp Voltage, LGC +4 VDC Voltage Margin, and LGC +14 VDC Voltage Margin.

Rev.	Date	TDR NO.	PAGES REVISED	APPROVAL	REFERENCES
1	6-7-66	29400	1, 2, 3, 4, 7	1, 2, 4	MM/ACM
2	7-21-66	30271	1, 2, 5	1, 3, 4	EA MB
3	8-4-66	30517	1, 2	4	EA MB
4	11-10-66	31901	2, 3, 4, 6	2, 3	EA MB
5	11-25-66	32061	4, 5		EA MB

Rev.	Date	TDR NO.	PAGES REVISED	APPROVAL	REFERENCES
1	6-7-66	29400	1, 2, 3, 4, 7	1, 2, 4	MM/ACM
2	7-21-66	30271	1, 2, 5	1, 3, 4	EA MB
3	8-4-66	30517	1, 2	4	EA MB
4	11-10-66	31901	2, 3, 4, 6	2, 3	EA MB
5	11-25-66	32061	4, 5		EA MB

INITIALIZATION	02000	ENTER
1. Insure that the LEM and G and N TEST CONF indicators on the monitor panel are lighted and that the AUX HTR PWR indicator on the Temperature Monitor Control panel is lighted.		
2. Insure that the OIA ON/ISS POWER DISABLED pushbutton on the Test Control panel is lighted.		
3. Press the CGC/LGC POWER ON and the 400 CPS POWER ON pushbuttons to apply power to the LGC and provide power for DSKY illumination. The pushbuttons shall light.		
4. Insure the STBY Condition lamp on the DSKY is lighted. If not, perform the following DSKY operations:		
VERB 21	NOUN 10	ENTER
00013		ENTER
VERIFICATION WITH SID REQUIRED BEFORE USE		

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SUBSYSTEM LEM G & N SYSTEM

3200 SUSPENSION POWER

18. Set switches and controls on the COUNTER as follows:

DISPLAY TIME (N<sub>2</sub>) to 10<sup>5</sup>  
DISPLAY RESET to ZERO  
CLOCK FREQUENCY DIVIDER to 10  
CLOCK SELECTOR to INT  
FUNCTION to OFF  
INPUT SELECTOR to C SENSE  
SENSE SELECTOR to FWD  
TRIGGER VOLTAGE ATTN D to 10  
TRIGGER VOLTAGE to fully counter-clockwise  
SAMPLE TIME (N<sub>1</sub>) to 0.02000  
FUNCTION to RATIO OR PERIOD.

19. Set the COUNTER INPUT 'D' SIGNAL selector on the Primary Signal Selector panel to 5. Insure that the D SIGNAL pushbutton is lighted.

20. Adjust the ATTN D selector on the Counter to the highest level that will cause triggering. Set the corresponding TRIGGER VOLTAGE control to insure that the Counter starts and subsequently stops in approximately 10 seconds. The Counter shall indicate approximately 100000.

Record the Counter indication.

21. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 123. Measure and record the 3200 cps 28V feedback voltage indicated on the DVM.

MASTER CLOCK SYNC

22. Insure that the Computer Calibration Equipment console has been calibrated within the past seven days.

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SUBSYSTEM LEM G & N SYSTEM

ASSY

11. Observe the Monitor panel to confirm that the ERROR DETECT indicator and ALARM INHIBIT pushbuttons are not lighted.

12. Observe the Temperature Monitor Control panel to confirm that the failure lights are not lighted.

13. After one hour has elapsed since performing step 9, press the EVENT MARKER on the Oscillograph Control panel and stop the Oscillograph.

14. Determine from the Oscillograph chart and by use of the calculation sheet, the mean temperature of the IRIG's and PIPA's during the one hour period. Record results.

15. Calculate and record the difference between the IRIG and PIPA temperatures determined in step 14.

16. Set the CROSSBAR CONTROL to 172. Adjust the G & N POWER ADJUST control on the Test Control panel until the DVM indicates 28.0 (±1.0) vdc. Record indications.

17. Set the CROSSBAR CONTROL to 28 VDC IMU STANDBY BUS

120. Measure and record the voltage indicated on the DVM.

10. Insure that the PSA HTR lamp on the Temperature Monitor Control Panel is lighted.

7. Start the oscillograph by setting the CHART DRIVE switch to MM/SEC.

8. Press the PROCEED/ISS STANDBY pushbutton. The PROCEED lamp shall go out and the ISS STANDBY lamp shall light. Immediately press the EVENT MARKER on the Oscillograph Control panel.

9. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 172. Adjust the G & N POWER ADJUST on the Test Control Panel until the DVM indicates 22.0 (±1.0) vdc. Record indications.

10. Insure that the PSA HTR lamp on the Temperature Monitor Control Panel is lighted.

SUBSYSTEM LEM G & N SYSTEM

ASSY

+14 VDC LGC POWER SUPPLY

31. Set the CROSSBAR CONTROL to 293. Measure and record the +14 VDC LGC Power Supply voltage indicated on the DVM.

RETICLE LAMP VOLTAGE

32. Set the CROSSBAR CONTROL to 169. Measure and record the Reticle Lamp voltage when the INCR RETICLE BRIGHTNESS control on the Computer Control and Reticle Dimmer Assembly is set to the maximum and minimum brightness positions.

33. Press and hold the STBY pushbutton on the DSKY until the STBY lamp goes out.

34. Set the LGC VOLTAGE CONTROL 4V and 14V control on the CTS Power Control panel to midrange and set the 4V and 14V switches to ON.

35. Set the VOLTAGE SELECT switch to LGC 4V and adjust the 4V control for 4.0 (±0.15) vdc.

NOTE: If the control does not vary the voltage, set the 4V switch to OFF; turn the voltage control fully counterclockwise and back to midrange; set the 4V switch to ON, and then readjust.

28. Deleted.

29. Measure and record the following characteristics on the Computer Test Set Oscilloscope:

a. Amplitude, volts peak-to-peak

b. Width at 50% of amplitude

c. Rise time at 10 to 90% amplitude.

30. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 194. Measure and record the +4 VDC LGC Power Supply voltage indicated on the DVM.

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30. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 194. Measure and record the +4 VDC LGC Power Supply voltage indicated on the DVM.

SUBSYSTEM LEM G &amp; N SYSTEM

ASSY

36. Perform the following DSKY operations:

- a. RESET Press  
b. VERB 36 ENTR

37. Set the STRT 1 and STRT 2 switches on the Buffer Circuit Assembly to ON.

38. Set the VOLTAGE SELECT switch to LGC 14V and adjust the 14V control for 14 (+0.2) vdc.

NOTE: If the control does not vary the voltage, set the 14V switch to OFF; turn the voltage control fully counterclockwise and back to midrange; set the 14V switch to ON, and then readjust.

39. Perform the following DSKY operations:

- a. VERB 57 ENTR  
b. 00015 ENTR  
c. VERB 21 NOUN 27 ENTR  
d. 77767 ENTR
40. Set the VOLTAGE SELECT switch to LGC 4V.

41. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 194. Monitor the LGC 4 VDC voltage on the DVM.

42. Press the INHIBIT COMPUTER POWER FAIL pushbutton on the Test Control panel. The INHIBIT COMPUTER POWER FAIL lamp shall light.

CGC VOLTAGE MARGIN TEST

43. Deleted  
44. Deleted

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APOLLO G&amp;N

EQUIPMENT TEST

DATA SHEET 1 OF 3

JDC  
NO. 12615  
REV. E  
INITIAL TORR 30271

JOB STANDBY CONTROL TEST

ASSEMBLY UNDER TEST		TEST HISTORY				
TITLE	DATE	START	END	SITE / LOCATION		
SER. NO.	DWG	REV	TIME	TOTAL ELAPSED		
MAJOR GROUND SUPPORT EQUIPMENT						
NAME SER. NO. CAL DATE						
NAME SER. NO. CAL DATE						
CONDUCTED BY NAME/AFFILIATION APPROVED BY NAME/AFFILIATION						
JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ ACC
6	Low 28 VDC IMU Standby Bus	volts	21.0		23.0	
14	Mean PIPA temp (one hour)	° F	129.0		132.0	
15	Mean IRIG temp (one hour)	° F				
	Difference (absolute)	° F	0.0		2.0	
16	28 VDC IMU Standby Bus	volts	27.0		29.0	
17	28 VDC IMU Standby Bus	volts	27.0		29.0	

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Chg. 1-23-65

SUBSYSTEM LEM G &amp; N SYSTEM

ASSY

48. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 194. Monitor the +4 VDC CGC power supply voltage indicated on the DVM. Turn on the Inhibit Power Fail Signal.

49. Using CONTROL 1 adjust the CTC 4 VDC supply voltage to 3.60 VDC using CONTROL 2, adjust the CTC 14 VDC supply to 12.8 VDC and to 16.2 VDC. Use CONTROL 2 again to adjust the 4 volt supply to 4.5 volts. Use CONTROL 2 to adjust the 14 volt supply to 12.6 volts and then 16.2 volts. No computer failures shall occur.

50. Adjust CONTROL 1 to set 4 volt supply to 4.0 VDC and adjust CONTROL 2 to set 14 volt supply to 14.0 VDC. Turn the Inhibit Power Fail Signal OFF. Using CONTROL 1 and CONTROL 2 set the computer 4 and 14 volt supplies to the following points.

- a. 3.5v & 14.0v  
b. 4.5v & 14.0v  
c. 4.0v & 16.5v  
d. 4.0v & 12.6v

at each of points a, b, c, &amp; d an LGC

Warning shall occur. (Other failures may also occur but are to be ignored). Return the 4 & 14 volt supplies to nominal values after each of the above steps and press the RESET button on the DSKY. All alarms shall go out within 60 seconds.

51. Set CONTROL 1 and CONTROL 2 switches to OFF.

52. Upon completion of the data sheets, make copies of the data sheets and forward one set each immediately to:

Digital Development Group  
MSS5Instrumentation Laboratory  
75 Cambridge Parkway  
Cambridge, Mass. 02142IMU Thermo Design Group  
MS89Instrumentation Laboratory  
75 Cambridge Parkway  
Cambridge, Massachusetts  
02142

and

DATE 15 MAR 66

APOLLO G&amp;N

EQUIPMENT TEST

DATA SHEET 2 OF 3

JDC  
NO. 12615  
REV. E

JOB STANDBY CONTROL TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ ACC
20	Counter indication	counts	069968		100032	
21	3200 cps 28V feedback voltage	volts	28.03		29.17	
26	CLOCK SYNC pulses Printout 1	cps	1023997		1024003	
	Printout 2	cps	XXXXX2399700		XXXXX2400300	
	Printout 3	cps	XXXXX2399700		XXXXX2400300	
	Printout 4	cps	XXXXX2399700		XXXXX2400300	
	Printout 5	cps	XXXXX2399700		XXXXX2400300	
	Printout 6	cps	XXXXX2399700		XXXXX2400300	
	Printout 7	cps	XXXXX2399700		XXXXX2400300	
	Printout 8	cps	XXXXX2399700		XXXXX2400300	
	Printout 9	cps	XXXXX2399700		XXXXX2400300	
29	Pulse Amplitude	v p-p	4.0			
	Pulse Width	μ sec	0.25		0.75	
	Pulse Rise Time	μ sec			0.2	
30	+4 VDC LGC power supply	volts	+3.85		+4.15	
31	+14 VDC LGC power supply	volts	+13.8		+14.2	
32	Maximum brightness (absolute)	v dc	4.00		4.73	
	Minimum brightness (absolute)	v dc			0.3	

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FORM 00147  
Chg. 7-23-65

APOLLO 68N  
EQUIPMENT TEST  
DATA SHEET 3 OF 3

JOB STANDBY CONTROL TEST

JDC  
No. 12615  
REV. E

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ ACC
49	No Fail Alarms					
50	Fail Alarms					
CALCULATIONS						
14	MEAN PIPA TEMP = Nominal PIPA TEMP + Deviation of Mean					
	Nominal PIPA TEMP indicating set point (Chart zero) 130.00 degrees					
	Deviation of PIPA Mean.					
	(+/-) No. MM (Between PIPA Mean & chart zero) $\frac{0.05V}{MM} \times \frac{2^\circ}{V} = (+/-)$ . . . . . °					
	MEAN PIPA TEMP (line a + line b) . . . . . °					
	MEAN IRIG TEMP = Nominal IRIG TEMP + Deviation of MEAN					
	Nominal IRIG TEMP indicating set point (chart zero) 135.00 degrees					
	Deviation of IRIG Mean					
	+/- No. MM (Between IRIG MEAN & Chart Zero) $\frac{X}{MM} \times \frac{0.2V}{V} \times \frac{2^\circ}{V} = (+/-)$ . . . . . °					
	MEAN IRIG TEMP (line d + line e) . . . . . °					
	Temp Difference = IRIG TEMP-PIPA TEMP					
	= line f - line c					
15	Line f . . . . . °					
	Line c . . . . . °					
	Temp Difference (absolute) . . . . . °					

DATE 15 MAR 68

FORM 10147  
Cir. 7-23-65



DESCRIPTION Provide a Standby Control Test for Low Bus Temperature Control, 3200 Suspension Power, Master Clock Sync, +4 VDC LGC Power Supply, +14 VDC LGC Power Supply, Reticle Lamp Voltage, LGC +4 VDC Voltage Margin, and LGC +14 VDC Voltage Margin.

Rev. Let.	Date	TDRR NO.	PAGES REVISED	APPROVAL	REFERENCES
A	6-7-66	29400	1, 2, 3, 4, 7	MJ NAS	PS 6015000
B	7-21-66	30271	1, 2, 5	MM ACMB	
C	8-4-66	30517	1, 2	EA MB	IMPORTANT
D	11-10-66	31901	2, 3, 4, 6	EA	see below
E	11-25-66	32061	4, 5	EA	
F	7-27-67	34233	1	EA	INTERVAL
					TOOLS AND MATERIAL

IMPORTANT: 1. Insure that connector assembly (2003099) is removed and W226-P1 is connected to the LGC test connector before proceeding with this JDC.

2. Oscilloscope sensitivities in this JDC are nominal values to be used only as a guide. Operator may change sensitivities as required.

3. Press the GGC/LGC POWER ON and the 400 CPS POWER ON pushbuttons to apply power to the LGC and provide power for DSKY illumination. The pushbuttons shall light.

4. Insure the STBY Condition lamp on the DSKY is lighted. If not, perform the following DSKY operations:

VERB 21 NOUN 10 ENTR 00013 ENTR 02000 ENTR

Press and hold the STBY pushbutton until the STBY condition lamp lights.

#### INITIALIZATION

1. Insure that the LEM and G and N TEST CONF indicators on the monitor panel are lighted and that the AUX HTR PWR indicator

VERIFICATION WITH SIDL REQUIRED BEFORE USE

DATE 15 MAR 66

5. Insure the PROCEED portion of the PROCEED/ISS STANDBY pushbutton on the Test Control panel is lighted.

6. Set up the Oscilloscope as follows:

a. Set CHANNELS 3 and 4 of the Oscilloscope Signal Selector panel to monitor the following signals:

1. PIPA Standby Temperature deviation CHANNEL 3-3 DC.

2. IRIG Standby Temperature deviation CHANNEL 4-3 DC.

b. Insure that the CHANNEL 3-3 DC and CHANNEL 4-4 DC pushbuttons on the Oscilloscope Signal Selector panel are lighted.

c. Zero and calibrate CHANNELS 3 and 4 on the Oscilloscope Amplifier, setting the CHART SPEEDS to 1 and the Range to 0.050 V/MM on the Oscilloscope control for CHANNEL 3 and 0.2 V/MM on the Oscilloscope control for CHANNEL 4.

d. Mark the Oscilloscope Channels as follows:

1. CHANNEL 3 "start of Standby PIPA TEMP test."

2. CHANNEL 4 "start of Standby IRIG TEMP test."

7. Start the oscilloscope by setting the CHART DRIVE switch to MM/SEC.

8. Press the PROCEED/ISS STANDBY pushbutton. The PROCEED lamp shall go out and the ISS STANDBY lamp shall light. Immediately press the EVENT MARKER on

the Oscilloscope control for CHANNEL 3 and 0.2 V/MM on the Oscilloscope control for CHANNEL 4.

14. Determine from the Oscilloscope chart and by use of the calculation sheet, the mean temperature of the IRIG's and PIPA's during the one hour period. Record results.

15. Calculate and record the difference between the IRIG and PIPA temperatures determined in step 14.

16. Set the CROSSBAR CONTROL to 172. Adjust the G & N POWER ADJUST control on the Test Control panel until the DVM indicates 28.0 ( $\pm 1.0$ ) vdc. Record indications.

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28 VDC IMU STANDBY BUS

17. Set the CROSSBAR CONTROL to 120. Measure and record the voltage indicated on the DVM.

3200 SUSPENSION POWER

18. Set switches and controls on the COUNTER as follows:

DISPLAY TIME (N<sub>2</sub>) to 10<sup>5</sup>

DISPLAY RESET to ZERO

CLOCK FREQUENCY DIVIDER to 10

CLOCK SELECTOR to INT

FUNCTION to OFF

INPUT SELECTOR to C SENSE

SENSE SELECTOR to FWD

TRIGGER VOLTAGE ATTN D to 10

TRIGGER VOLTAGE to fully counter-clockwise

23. Set the Electronic Counter Controls on the Computer Calibration Equipment Console as follows:

FUNCTION switch to FREQ.

INPUT VOLTS RMS switch to 6

SLOPE switch to +

GATE switch to OPEN

TRIGGER LEVEL switch to CENTER.

24. Set the FREQ-TIME switch on the Electronic Counter to the 100-second position (first setting from fully counterclockwise).

25. Connect cable W259 (2014470-011) P-6 to the W232-P4 and P1 to Counter connector on the Control and interface panels of the Computer Calibration Equipment console. Connect P4 and P5 of cable W259 to J7 and J8 on Buffer Assembly, connect P2 and P3 of cable W259 to SIGNAL HI and SIGNAL LO on Digital Ohmmeter.

26. Select an INPUT VOLTS RMS switch position on the Electronic Counter where the TRIGGER LEVEL can be properly adjusted. Set the TRIGGER LEVEL to the center of the counting range. Set the GATE switch to AUTO. Insure that printer power is set to

21. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 123.

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ON and the printer is in Record Mode. Read the frequency directly in CPS. Count output frequency for 15 minutes and record data from the print out of Computer Calibration Equipment Console.

27. Disconnect cable W259 P1 from the Counter connector and connect it directly to the vertical input of the Oscilloscope.

28. Deleted.

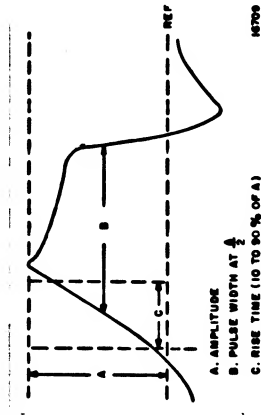
29. Measure and record the following characteristics on the Computer Test Set Oscilloscope:

a. Amplitude, volts peak-to-peak

b. Width at 50% of amplitude

c. Rise time at 10 to 90% amplitude.

30. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 194. Measure and record the +4 VDC LGC Power Supply voltage indicated on the DVM.



31. Set the CROSSBAR CONTROL to 299. Measure and record the +14 VDC LGC Power Supply voltage indicated on the DVM.

32. Set the CROSSBAR CONTROL to 169. Measure and record the Reticle Lamp voltage when the INCR RETICLE BRIGHTNESS control on the Computer Control and Reticle Dimmer Assembly is set to the maximum and minimum brightness positions.

33. Press and hold the STBY pushbutton on the DSKY until the STBY lamp goes out.

34. Set the LGC VOLTAGE CONTROL 4V and 14V control on the CTS Power Control panel to midrange and set the 4V and 14V switches to ON.

35. Set the VOLTAGE SELECT switch to LGC 4V and adjust the 4V control for 4.0 ( $\pm 0.15$ ) vdc.

NOTE: If the control does not vary the voltage, set the 4V switch to OFF; turn the voltage control fully counterclockwise and back to midrange; set the 4V switch to ON, and then readjust.

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SUBSYSTEM	LEM G & N SYSTEM	ASSY
36. Perform the following DSKY operations:		45. Set the AGC VOLTAGE 1 and 2 controls on the CTS Power Control panel to midrange and set the CONTROL 1 and CONTROL 2 switches to ON.
a. RESET	Press	46. Set the VOLTAGE SELECT switch to CGC 4V and adjust the CONTROL 1 for 4.0 ( $\pm 0.15$ ) vdc.
b. VERB 36	ENTR	NOTE: If the control does not vary the voltage, set the CONTROL 1 switch OFF; turn CONTROL 1 fully counterclockwise and back to midrange; set the CONTROL 1 switch to ON, and then readjust.
37. Set the STRT 1 and STRT 2 switches on the Buffer Circuit Assembly to ON.		47. Set the VOLTAGE SELECT switch to CGC 14V and adjust the CONTROL 2 for 14 ( $\pm 0.2$ ) vdc.
38. Set the VOLTAGE SELECT switch to LGC 14V and adjust the 14V control for 14 ( $\pm 0.2$ ) vdc.		NOTE: If the control does not vary the voltage, set the CONTROL 2 switch to OFF; turn CONTROL 2 fully counterclockwise and back to midrange; set the CONTROL 2 switch to ON, and then readjust.
NOTE: If the control does not vary the voltage, set the 14V switch to OFF; turn the voltage control fully counterclockwise and back to midrange; set the 14V switch to ON, and then readjust.		
39. Perform the following DSKY operations:		
a. VERB 57	ENTR	
b. 00015	ENTR	
c. VERB 21	NOUN 27	
d. 77767	ENTR	
40. Set the VOLTAGE SELECT switch to LGC 4V.		
41. Set the CROSSEBAR CONTROL on the Primary Signal Selector panel to 194.		
Monitor the LGC 4 VDC voltage on the DVM.		
42. Press the INHIBIT COMPUTER POWER FAIL pushbutton on the Test Control panel. The INHIBIT COMPUTER POWER FAIL lamp shall light.		
CGC VOLTAGE MARGIN TEST		
43. Deleted		
44. Deleted		

SUBSYSTEM	LEM G & N SYSTEM	ASSY
	<p>48. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 194. Monitor the +4 VDC CGC power supply voltage indicated on the DVM. Turn on the Inhibit Power Fail Signal.</p> <p>49. Using CONTROL 1 adjust the CTC 4 VDC supply voltage to 3.60 VDC using CONTROL 2, adjust the CTC 14 VDC supply to 12.6 VDC and to 16.2 VDC. Use CONTROL again to adjust the 4 volt supply to 4.5 volts. Use CONTROL 2 to adjust the 14 volt supply to 12.6 volts and then 16.2 volts. No computer failures shall occur.</p> <p>50. Adjust CONTROL 1 to set 4 volt supply to 4.0 VDC and adjust CONTROL 2 to set 14 volt supply to 14.0 VDC. Turn the Inhibit Power Fail Signal OFF. Using CONTROL 1 and CONTROL 2 set the computer 4 and 14 volt supplies to the following points.</p> <ul style="list-style-type: none"> <li>a. 3.5v &amp; 14.0v</li> <li>b. 4.5v &amp; 14.0v</li> <li>c. 4.0v &amp; 16.5v</li> <li>d. 4.0v &amp; 12.6v</li> </ul> <p>at each of points a, b, c, &amp; d an LGC</p>	<p>Warning shall occur. (Other failures may also occur but are to be ignored). Return the 4 &amp; 14 volt supplies to nominal values after each of the above steps and press the RESET button on the DSKY. All alarms shall go out within 60 seconds.</p> <p>51. Set CONTROL 1 and CONTROL 2 switches to OFF.</p> <p>52. Upon completion of the data sheets, make copies of the data sheets and forward one set each immediately to:</p> <p>Digital Development Group MS55 Instrumentation Laboratory 75 Cambridge Parkway Cambridge, Mass. 02142</p> <p>IMU Thermo Design Group MS99 Instrumentation Laboratory 75 Cambridge Parkway Cambridge, Massachusetts 02142</p>

NO. 12615 JDC  
REV. F  
INITIAL TDRR 30271

ASSEMBLY UNDER TEST				TEST HISTORY			
TITLE _____		DATE _____		START _____		END _____	
SER. NO. _____		DWG. _____		TIME _____		SITE / LOCATION _____	
REV. _____		_____		START _____		END _____	
MAJOR GROUND SUPPORT EQUIPMENT							
NAME _____		SER. NO. _____		CAL. DATE _____			
NAME _____		SER. NO. _____		CAL. DATE _____			
CONDUCTED BY _____		NAME/AFFILIATION _____		APPROVED BY _____		NAME/AFFILIATION _____	
JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
9	Low 28 VDC IMU Standby Bus	volts	21.0		23.0		
14	Mean PIPA temp (one hour)	° F	129.0		132.0		
	Mean IRIG temp (one hour)	° F					
15	Mean Temperature Difference (absolute)	° F	0.0		3.0		
16	28 VDC IMU Standby Bus	volts	27.0		29.0		
17	28 VDC IMU Standby Bus	volts	27.0		29.0		

JDC  
NO. 12615  
REV. F

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REF ACC
20	Counter indication	counts	099968		100032	
21	3200 cps 28V feed- back voltage	volts	28. 03		28. 17	
26	CLOCK SYNC pulses Printout 1	cps	1023997		1024003	
	Printout 2	cps	XXXXX2399700		XXXXX2400300	
	Printout 3	cps	XXXXX2399700		XXXXX2400300	
	Printout 4	cps	XXXXX2399700		XXXXX2400300	
	Printout 5	cps	XXXXX2399700		XXXXX2400300	
	Printout 6	cps	XXXXX2399700		XXXXX2400300	
	Printout 7	cps	XXXXX2399700		XXXXX2400300	
	Printout 8	cps	XXXXX2399700		XXXXX2400300	
	Printout 9	cps	XXXXX2399700		XXXXX2400300	
29	Pulse Amplitude	v p-p	4. 0			
	Pulse Width	$\mu$ sec	0. 25		0. 75	
	Pulse Rise Time	$\mu$ sec			0. 2	
30	+4 VDC LGC power supply	volts	+ 3. 85		+ 4. 15	
31	+14 VDC LGC power supply	volts	+ 13. 8		+ 14. 2	
32	Maximum bright- ness (absolute)	v dc	4. 08		4. 73	
	Minimum bright- ness (absolute)	v dc			0. 3	

APOLLO G8N  
EQUIPMENT TEST  
DATA SHEET 3 OF 3

JDC  
NO. 12615  
REV. F

JOB STANDBY CONTROL TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ/ACC
49	No Fail Alarms					
50	Fail Alarms					
CALCULATIONS						
14	MEAN PIPA TEMP = Nominal PIPA TEMP + Deviation of Mean					
	Nominal PIPA TEMP Indicating set point (Chart zero) 130.00 degrees					
	Deviation of PIPA Mean.					
	(±) No. MM (Between PIPA Mean & chart zero) $\frac{0.05V}{MM} \times \frac{2^\circ}{V} = (\pm)$ °					
	MEAN PIPA TEMP (line a + line b) _____ °					
	MEAN IRIG TEMP = Nominal IRIG TEMP + Deviation of MEAN					
15	Nominal IRIG TEMP Indicating set point (chart zero) 135.00 degrees					
	Deviation of IRIG Mean					
	± No. MM (Between IRIG MEAN & Chart Zero) $\frac{X}{MM} \times \frac{2^\circ}{V} = + (\pm)$ °					
	MEAN IRIG TEMP (line d + line e) _____ °					
	Temp Difference = IRIG TEMP-PIPA TEMP					
	= line f - line c					
Line f _____ °						
Line c _____ °						
Temp Difference (absolute) _____ °						

DATE 15 MAR 66

DESCRIPTION Provide a Standby Control Test for Low Bus Temperature Control, 3200 Suspension Power, Master Clock Sync, +4 VDC LGC Power Supply, +14 VDC LGC Power Supply, Reticle Lamp Voltage, LGC +4 VDC Voltage Margin, and LGC +14 VDC Voltage Margin.

Rev.	Let.	Date	TDRR NO.	PAGES REVISED	APPROVAL	REFERENCES
	A	6-7-66	29400	1, 2, 3, 4, 7	1, 2, 4	MM 1, 2, 4
	B	7-21-66	30271	1, 2, 3	1, 3, 4	EA 1, 3, 4
	C	8-4-66	30517	1, 2	4	EA 1, 2
	D	11-10-66	31901	2, 3, 4, 6	2, 3	EA 1, 2
	E	11-25-66	32061	4, 5	-	EA 1, 2
	F	7-27-67	34233	1	1	EA 1, 2
	G	8-31-67	34455	1, 4-6	2, 3	EA 1, 2

- IMPORTANT: 1. Insure that connector assembly (2003099) is removed and W226-P1 is connected to the LGC test connector before proceeding with this JDC.
2. Oscilloscope sensitivities in this JDC are nominal values to be used only as a guide. Operator may change sensitivities as required.
- INITIALIZATION
1. Insure that the LEM and G and N TEST CONF indicators on the monitor panel are lighted and that the AUX HTR PWR indicator

VERIFICATION WITH SIDL REQUIRED BEFORE USE

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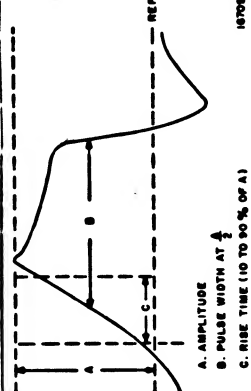
- b. 00013 ENTR
- c. 02000 ENTR
- d. Press and hold the STBY pushbutton until the STBY condition lamp lights.
5. Insure the PROCEED portion of the PROCEED/ISS STANDBY pushbutton on the Test Control panel is lighted.
6. Set up the Oscilloscope as follows:
- a. Set CHANNELS 3 and 4 of the Oscilloscope Signal Selector panel to monitor the following signals:
1. PIPA Standby Temperature deviation CHANNEL 3-3 DC.
2. IRIG Standby Temperature deviation CHANNEL 4-3 DC.
- b. Insure that the CHANNEL 3-3 DC and CHANNEL 4-4 DC pushbuttons on the Oscilloscope Signal Selector panel are lighted.
- c. Zero and calibrate CHANNELS 3 and 4 on the Oscilloscope Amplifier, setting the CHART SPEEDS to 1 and the Range to 0.050 V/MM on the Oscilloscope control for CHANNEL 3 and 0.2 V/MM on the Oscilloscope control for CHANNEL 4.
- d. Mark the Oscilloscope Channels as follows:
1. CHANNEL 3 "start of Standby PIPA TEMP test."
2. CHANNEL 4 "start of Standby IRIG TEMP test."
7. Start the oscilloscope by setting the CHART DRIVE switch to MM/SEC.
8. Press the PROCEED/ISS STANDBY pushbutton. The PROCEED lamp shall go
- out and the ISS STANDBY lamp shall light. Immediately press the EVENT MARKER on the Oscilloscope Control panel.
9. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 172. Adjust the G & N POWER ADJUST on the Test Control Panel until the DVM indicates 22.0 (±1.0) vdc. Record indications.
10. Insure that the PSA HTR lamp on the Temperature Monitor Control Panel is lighted.
11. Observe the Monitor panel to confirm that the ERROR DETECT indicator and ALARM INHIBIT pushbuttons are not lighted.
12. Observe the Temperature Monitor Control panel to confirm that the failure lights are not lighted.
13. After one hour has elapsed since performing step 9, press the EVENT MARKER on the Oscilloscope Control panel and stop the Oscilloscope.
14. Determine from the Oscilloscope chart and by use of the calculation sheet, the mean temperature of the IRIG's and PIPA's during the one hour period. Record results.
15. Calculate and record the difference between the IRIG and PIPA temperatures determined in step 14.
16. Set the CROSSBAR CONTROL to 172. Adjust the G & N POWER ADJUST control on the Test Control panel until the DVM indicates 28.0 (±1.0) vdc. Record indications.

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- 28 VDC IMU STANDBY BUS
17. Set the CROSSBAR CONTROL to 120. Measure and record the voltage indicated on the DVM.
- 3200 SUSPENSION POWER
18. Set switches and controls on the COUNTER as follows:
- DISPLAY TIME (N<sub>2</sub>) to 10<sup>5</sup>
- DISPLAY RESET to ZERO
- CLOCK FREQUENCY DIVIDER to 10
- CLOCK SELECTOR to INT
- FUNCTION to OFF
- INPUT SELECTOR to C SENSE
- SENSE SELECTOR to FWD
- TRIGGER VOLTAGE ATTN D to 10
- TRIGGER VOLTAGE to fully counter-clockwise
- SAMPLE TIME (N<sub>1</sub>) to 032000
- FUNCTION to RATIO OR PERIOD.
19. Set the COUNTER INPUT "Y" SIGNAL selector on the Primary Signal Selector panel to 5. Insure that the D SIGNAL pushbutton is lighted.
20. Adjust the ATTEN D selector on the Counter to the highest level that will cause triggering. Set the corresponding TRIGGER VOLTAGE control to insure that the Counter starts and subsequently stops in approximately 10 seconds. The Counter shall indicate approximately 100000.
- Record the Counter indication.
21. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 123.
- Measure and record the 3200 cps 28V feedback voltage indicated on the DVM.
- MASTER CLOCK SYNC
22. Insure that the Computer Calibration Equipment console has been calibrated within the past seven days.
23. Set the Electronic Counter Controls on the Computer Calibration Equipment Console as follows:
- FUNCTION switch to FREQ.
- INPUT VOLTS RMS switch to 6
- SLOPE switch to +
- GATE switch to OPEN
- TRIGGER LEVEL switch to CENTER.
24. Set the FREQ-TIME switch on the Electronic Counter to the 100-second position (first setting from fully counterclockwise).
25. Connect cable W259 (2014470-011) P-6 to W232-P4 and P1 to Counter connector on the Control and Interface panels of the Computer Calibration Equipment console. Connect P4 and P5 of cable W259 to J7 and J8 on Buffer Assembly, connect P2 and P3 of cable W259 to SIGNAL HI and SIGNAL LO on Digital Ohmmeter.
26. Select an INPUT VOLTS RMS switch position on the Electronic Counter where the TRIGGER LEVEL can be properly adjusted. Set the TRIGGER LEVEL to the center of the counting range. Set the GATE switch to AUTO. Insure that printer power is set to

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- ON and the printer is in Record Mode. Read the frequency directly in CPS. Count output frequency for 15 minutes and record data from the print out of Computer Calibration Equipment Console.
27. Disconnect cable W259 P1 from the Counter connector and connect it directly to the vertical input of the Oscilloscope.
28. Deleted.
29. Measure and record the following characteristics on the Computer Test Set Oscilloscope:
- a. Amplitude, measured from reference to pulse maximum positive level
- b. Width at 50% of amplitude
- c. Rise time at 10 to 90% amplitude.
- NOTE: Disregard PROG alarm which may occur in steps 35 through 37. If the alarm occurs it will be extinguished in step 38.
35. Set the AGC VOLTAGE 1 and 2 controls on the CTS Power Control panel to midrange and set CONTROL 1 and CONTROL 2 switches to ON.
36. Set the VOLTAGE SELECT switch to AGC (+4V) +3V and adjust CONTROL 1 for 4.0 (±0.15) vdc.
- +14 VDC LGC POWER SUPPLY
31. Set the CROSSBAR CONTROL to 293. Measure and record the +14 VDC LGC Power Supply voltage indicated on the DVM. RETICLE LAMP VOLTAGE
32. Set the CROSSBAR CONTROL to 169. Measure and record the Reticle Lamp voltage when the INCR RETICLE BRIGHTNESS control on the Computer Control and Reticle Dimmer Assembly is set to the maximum and minimum brightness positions.
33. Press and hold the STBY pushbutton on the DSKY until the STBY lamp goes out.
- LGC VOLTAGE MARGIN TEST
34. Press the INHIBIT COMPUTER POWER FAIL pushbutton on the Test Control panel. The INHIBIT COMPUTER POWER FAIL lamp shall light.
- NOTE: Disregard PROG alarm which may occur in steps 35 through 37. If the alarm occurs it will be extinguished in step 38.
35. Set the AGC VOLTAGE 1 and 2 controls on the CTS Power Control panel to midrange and set CONTROL 1 and CONTROL 2 switches to ON.
36. Set the VOLTAGE SELECT switch to AGC (+4V) +3V and adjust CONTROL 1 for 4.0 (±0.15) vdc.
- +4 VDC LGC POWER SUPPLY
30. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 194. Measure and record the +4 VDC LGC Power Supply voltage indicated on the DVM.



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NOTE: If the control does not vary the voltage, set CONTROL 1 switch to OFF; turn CONTROL 1 fully counterclockwise and back to midrange; set CONTROL 1 switch to ON, and then readjust.

37. Set the VOLTAGE SELECT switch to AGC (+14V) +13V and adjust CONTROL 2 for 14 (+0.2) vdc.

NOTE: If the control does not vary the voltage, set CONTROL 2 switch to OFF; turn CONTROL 2 fully counterclockwise and back to midrange; set CONTROL 1 switch to ON, and then readjust.

38. Perform the following DSKY operations:  
a. RESET Press  
b. VERB 36 ENTR  
39. Set the STRT 1 and STRT 2 switches on the Buffer Circuit Assembly to ON.  
40. Perform the following DSKY operations:  
a. VERB 57 ENTR  
b. 00015 ENTR  
c. VERB 21 NOUN 27 ENTR  
d. 77767 ENTR

41. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 194. Monitor the LGC 4 VDC voltage on the DVM.

42. Using CONTROL 1, adjust the LGC 4 VDC supply voltage to 3.00 vdc. Using CONTROL 2, adjust the LGC 14 VDC supply voltage to 12.6 vdc and to 16.2 vdc. Use CONTROL 1 again to adjust the 4 volt supply to 4.5 vdc. Use CONTROL 2 to adjust the 14 volt supply to 12.6 vdc and then to 16.2 vdc. No computer failures shall occur. LGC VOLTAGE FAIL ALARM LIMITS TEST  
43. Press INHIBIT COMPUTER POWER. The FAIL pushbutton on Test Control panel. The INHIBIT COMPUTER POWER FAIL pushbutton shall go out.

44. Adjust CONTROL 1 on CTS Power Control panel to set the LGC 4 VDC supply to 4.0 vdc. Adjust CONTROL 2 to set the LGC 14 VDC supply to 14.0 vdc. Monitor the CGC/LGC WARNING NO. 1 on the Monitor panel while using CONTROL 1 and CONTROL 2 to set the 4 and 14 volt supplies to the values specified in steps a through d below. At each step a CGC/LGC WARNING NO. 1 shall occur. (Other failures may also occur but are to be ignored.) Return the 4 and 14 volt supplies to nominal values after each step and press RESET pushbutton on the DSKY. All alarms shall go out within 60 seconds.  
a. 3.5v and 14.0v  
b. 4.5v and 14.0v  
c. 4.0v and 16.5v  
d. 4.0v and 12.8v

45. Set CONTROL 1 and CONTROL 2 switches on CTS Power Control panel to OFF.

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46. Upon completion of data sheets, make copies of data sheets and forward one set each immediately to:

Digital Development Group  
MS 35

Instrumentation Laboratory  
75 Cambridge Parkway  
Cambridge, Mass. 02142

and

IMU Thermo Design Group  
MS 99

Instrumentation Laboratory  
75 Cambridge Parkway  
Cambridge, Mass. 02142

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ASSEMBLY UNDER TEST		TEST HISTORY			
TITLE	DATE	START	END	SITE / LOCATION	
SER. NO.	DWG	REV.	TIME	START	END
MAJOR GROUND SUPPORT EQUIPMENT					
NAME	SER. NO.	SER. NO.	CAL DATE		
NAME	SER. NO.	SER. NO.	CAL DATE		
CONDUCTED BY NAME/AFFILIATION APPROVED BY NAME/AFFILIATION					
JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE
9	Low 28 VDC IMU Standby Bus	volts	21.0		23.0
14	Mean PIPA temp (one hour)	° F	129.0		132.0
	Mean IRIG temp (one hour)	° F			
15	Mean Temperature Difference (absolute)	° F	0.0		3.0
16	28 VDC IMU Standby Bus	volts	27.0		29.0
17	28 VDC IMU Standby Bus	volts	27.0		29.0

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FORM 10-66  
(Rev. 1-23-66)

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ ACC
20	Counter Indication	counts	099968		100032	
21	3200 cps 28V feed-back voltage	volts	28.03		28.17	
26	CLOCK SYNC pulses Printout 1	cps	XXXXX2399700		XXXXX2400300	
	Printout 2	cps	XXXXX2399700		XXXXX2400300	
	Printout 3	cps	XXXXX2399700		XXXXX2400300	
	Printout 4	cps	XXXXX2399700		XXXXX2400300	
	Printout 5	cps	XXXXX2399700		XXXXX2400300	
	Printout 6	cps	XXXXX2399700		XXXXX2400300	
	Printout 7	cps	XXXXX2399700		XXXXX2400300	
	Printout 8	cps	XXXXX2399700		XXXXX2400300	
	Printout 9	cps	XXXXX2399700		XXXXX2400300	
29	Pulse Amplitude	volts	4.0			
	Pulse Width	µsec	0.25		0.75	
	Pulse Rise Time	µsec			0.2	
30	+4 VDC LGC power supply	volts	+3.85		+4.15	
31	+14 VDC LGC power supply	volts	+13.8		+14.2	
32	Maximum brightness (absolute)	v dc	4.09		4.73	
	Minimum brightness (absolute)	v dc			0.3	

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APOLLO G&N  
EQUIPMENT TEST  
DATA SHEET 3 OF 3

JDC  
NO. 12615  
REV. G

JOB STANDBY CONTROL TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ ACC
42	No Fail Alarms					
44	Fail Alarms					
CALCULATIONS						
14	MEAN PIPA TEMP = Nominal PIPA TEMP + Deviation of Mean Nominal PIPA TEMP indicating set point (Chart zero) 130.00 degrees Deviation of PIPA Mean. (±) No. MM (Between PIPA Mean & chart zero) $0.05V \times \frac{2^\circ}{V} = \pm$ $\frac{MM}{V}$ $^\circ$ MEAN PIPA TEMP (line a + line b) $^\circ$ MEAN IRIG TEMP = Nominal IRIG TEMP + Deviation of MEAN Nominal IRIG TEMP indicating set point (chart zero) 135.00 degrees Deviation of IRIG Mean $\pm$ No. MM (Between IRIG MEAN & Chart Zero) $0.2V \times \frac{2^\circ}{V} = \pm$ $\frac{MM}{V}$ $^\circ$ MEAN IRIG TEMP (line d + line e) $^\circ$					
15	Temp Difference = IRIG TEMP-PIPA TEMP = line f - line c Line f $^\circ$ Line c $^\circ$ Temp Difference (absolute) $^\circ$					

DATE 15 MAR 66

REVIEW  
FOR APPROVAL

SUBSYSTEM LEM G & N SYSTEM

DESCRIPTION Provide a Standby Control Test for Low Bus Temperature Control, 3200 Suspension Power, Master Clock Sync, +4 VDC LGC Power Supply, +14 VDC LGC Power Supply, Reticle Lamp Voltage, LGC +4 VDC Voltage Margin, and LGC +14 VDC Voltage Margin.

Rev.	Date	TORR NO.	PAGES REVISED	APPROVAL	REFERENCES
1	6-7-66	29400	1, 2, 3, 4, 7	M. T. NASA	PS 6015000
2	7-21-66	30271	1, 2, 5	EA	ACM
3	8-4-66	30517	1, 2	EA	MB
4	11-10-66	31901	2, 3, 4, 6	EA	MB
5	11-25-66	32061	4, 5	EA	MB
6	7-27-67	34233	1	EA	MB
7	8-31-67	34455	1, 4-6	EA	MB
8	2-15-68	35625	1, 2, 3, 4, 5	EA	MB

IMPORTANT: 1. Insure that connector assembly (2003099) is removed and W226-P1 is connected to the LGC test connector before proceeding with this JDC.

2. Oscilloscope sensitivities in this JDC are nominal values to be used only as a guide. Operator may change sensitivities as required.

INITIALIZATION

1. Insure that the LEM and G and N TEST CONF indicators on the Monitor panel are lighted and that the AUX HTR PWR indicator

VERIFICATION WITH SID REQUIRED BEFORE USE

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on the Temperature Monitor Control panel is lighted.

2. Insure that the OIA ON/ISS POWER DISABLED pushbutton on the Test Control panel is lighted.

3. Press the CGC/LGC POWER ON and the 400 CPS POWER ON pushbuttons to apply power to the LGC and provide power for DSKY illumination. The pushbuttons shall light.

4. Insure STBY condition lamp on the DSKY is lighted. If STBY condition lamp is not lighted, ignore alarms which may be present enter VERB 36 and press RESET pushbutton on DSKY; press ALARM RESET pushbutton on Programmer and Monitor panel; and perform the following DSKY operations:  
a. VERB 21 NOUN 10 ENTR

28 VDC IMU STANDBY BUS  
17. Set the CROSSBAR CONTROL to 120. Measure and record the voltage indicated on the DVM.

3200 SUSPENSION POWER

18. Set switches and controls on the COUNTER as follows:  
DISPLAY TIME (N<sub>2</sub>) to 10<sup>5</sup>  
DISPLAY RESET to ZERO  
CLOCK FREQUENCY DIVIDER to 10  
CLOCK SELECTOR to INT

FUNCTION to OFF  
INPUT SELECTOR to C SENSE  
SENSE SELECTOR to FWD  
TRIGGER VOLTAGE ATTN D to 10  
TRIGGER VOLTAGE to fully counter-clockwise  
SAMPLE TIME (N<sub>1</sub>) to 032000  
FUNCTION to RATIO OR PERIOD.

19. Set the COUNTER INPUT "D" SIGNAL selector on the Primary Signal Selector panel to 5. Insure that the D SIGNAL pushbutton is lighted.

20. Adjust the ATTN D selector on the Counter to the highest level that will cause triggering. Set the corresponding TRIGGER VOLTAGE control to insure that the Counter starts and subsequently stops in approximately 10 seconds. The Counter shall indicate approximately 100000.

21. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 123.

Measure and record the 3200 cps 28V feed-back voltage indicated on the DVM.

MASTER CLOCK SYNC

NOTE: Ignore step 22 if Auxiliary Calibration System is to be used.

22. Insure that the AGC Calibration System has been calibrated within the past seven days.

23. Set Electronic Counter controls as follows:

FUNCTION switch to FREQ.  
INPUT VOLTS RMS switch to 6  
SLOPE switch to +  
GATE switch to OPEN

TRIGGER LEVEL switch to CENTER.  
24. Set the FREQ-TIME switch on the Electronic Counter to the 100-second position (first setting from fully counterclockwise).

25. Connect cable W259-P6 to W232-P4 and connect cable W259-P1 to COUNTER connector on Control and Interface panel. Connect P4 and P5 of cable W259 to J7 and J8 on Buffer Assembly, connect P2 and P3 of cable W259 to SIGNAL HI and SIGNAL LO on Digital Ohmmeter.

26. Select an INPUT VOLTS RMS switch position on the Electronic Counter where the TRIGGER LEVEL can be properly adjusted. Set the TRIGGER LEVEL to the center of the counting range. Set the GATE switch to AUTO. Insure that printer power is set to

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ASSY

b. 00013 ENTR  
c. 02000 ENTR  
d. Press and hold PRO (or STBY) pushbutton until STBY condition lamp lights.

5. Insure the PROCEED pushbutton on the PROCEED/ISS STANDBY pushbutton on the Test Control panel is lighted.

6. Set up the Oscilloscope as follows:  
a. Set CHANNELS 3 and 4 of the Oscilloscope Signal Selector panel to monitor the following signals:

1. PIPA Standby Temperature deviation CHANNEL 3-3 DC.  
2. IRIG Standby Temperature deviation CHANNEL 4-3 DC.

b. Insure that the CHANNEL 3-3 DC and CHANNEL 4-4 DC pushbuttons on the Oscilloscope Signal Selector panel are lighted.

c. Zero and calibrate CHANNELS 3 and 4 on the Oscilloscope Amplifier, setting the CHART SPEEDS to 1 and the Range to 0.050 V/MM on the Oscilloscope control for CHANNEL 3 and 0.2 V/MM on the Oscilloscope control for CHANNEL 4.

d. Mark the Oscilloscope Channels as follows:  
1. CHANNEL 3 "start of Standby PIPA TEMP test."  
2. CHANNEL 4 "start of Standby IRIG TEMP test."

7. Start the oscilloscope by setting the CHART DRIVE switch to MM/SEC.

8. Press the PROCEED/ISS STANDBY pushbutton. The PROCEED lamp shall go

out and the ISS STANDBY lamp shall light. Immediately press the EVENT MARKER on the Oscilloscope Control panel.

NOTE: CGC/LGC WARNING

NO. 1 may light in step 9.

Ignore indication.

9. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 172. Adjust the G & N POWER ADJUST on the Test Control Panel until the DVM indicates 22.0 (±1.0) vdc. Record indications.

10. Insure that the PSA HTR PWR lamp on the Temperature Monitor Control Panel is lighted.

11. Observe the Monitor panel to confirm that the ERROR DETECT indicator and ALARM INHIBITED pushbuttons are not lighted.

12. Observe the Temperature Monitor Control panel to confirm that the failure lights are not lighted.

13. After one hour has elapsed since performing step 9, press the EVENT MARKER on the Oscilloscope Control panel and stop the Oscilloscope.

14. Determine from the Oscilloscope chart and by use of the calculation sheet, the mean temperature of the IRIG's and PIPA's during the one hour period. Record results.

15. Calculate and record the difference between the IRIG and PIPA temperatures determined in step 14.

16. Set the CROSSBAR CONTROL to 172. Adjust the G & N POWER ADJUST control on the Test Control panel until the DVM indicates 28.0 (±1.0) vdc. Record indications.

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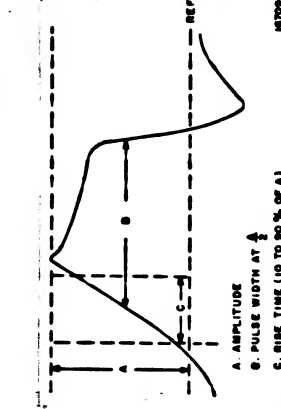
ON and the printer is in Record Mode. Read the frequency directly in CPS. Count output frequency for 15 minutes and record data from the printout.

27. Disconnect cable W259 P1 from the Counter connector and connect it directly to the vertical input of the Oscilloscope.

28. Deleted.

29. Measure and record the following characteristics on the Computer Test Set Oscilloscope:

a. Amplitude: measured from reference to pulse maximum positive level  
b. Width at 50% of amplitude  
c. Rise time at 10 to 90% amplitude.



30. Perform the following DSKY and CTS operations:  
a. Press and hold PRO (or STBY) pushbutton until STBY indicator goes out.

b. VERB 36 ENTR  
c. Press RESET pushbutton.  
d. Press ALARM RESET pushbutton on Programmer and Monitor panel of CTS.

RETICLE LAMP VOLTAGE  
31. Set CROSSBAR CONTROL on Primary Signal Selector panel to 169. Measure and record reticle lamp voltage when INCR

RETICLE BRIGHTNESS control on Computer Control and Reticle Dimmer Assembly is set to maximum and minimum brightness positions.

+4 VDC LGC POWER SUPPLY  
32. Set CROSSBAR CONTROL on Primary Signal Selector panel to 194. Measure and record +4 VDC LGC Power Supply voltage indicated on DVM.

+14 VDC LGC POWER SUPPLY  
33. Set CROSSBAR CONTROL to 293. Measure and record +14 VDC LGC Power Supply voltage indicated on DVM.

LGC VOLTAGE MARGIN TEST  
34. Press to light INHIBIT COMPUTER POWER FAIL pushbutton on Test Control panel.

35. Set AGC VOLTAGE 1 and 2 controls on CTS Power Control panel to midrange and set CONTROL 1 and CONTROL 2 switches to ON.

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NOTE: If the control does not vary the voltage in the next step, set CONTROL 1 switch to OFF; turn CONTROL 1 fully counterclockwise and back to midrange; set CONTROL 1 switch to ON, and then readjust.

36. Set VOLTAGE SELECT switch to AGC (+4V)+3V and adjust CONTROL 1 for 4.0 ( $\pm 0.20$ ) vdc.

NOTE: If the control does not vary the voltage in the next step, set CONTROL 2 switch to OFF; turn CONTROL 2 fully counterclockwise and back to midrange; set CONTROL 2 switch to ON, and then readjust.

37. Set VOLTAGE SELECT switch to AGC (+14V)+13V and adjust CONTROL 2 for 14.0 ( $\pm 0.40$ ) vdc.

38. Perform the following DSKY operations:

a. VERB 21 NOUN 27 ENTR

b. 77767 ENTR

39. Set CROSSBAR CONTROL on Primary Signal Selector panel to 194 to monitor the +4 VDC LGC Power Supply voltage on DVM.

40. Use CONTROL 1 to adjust +4 VDC LGC Power Supply voltage to 3.40 vdc. Use CONTROL 2 to adjust +14 VDC LGC Power Supply voltage to 12.1 vdc and to

16.4 vdc. Use CONTROL 1 again to adjust the 4 volt supply to 4.60 vdc. Use CONTROL 2 to adjust the 14 volt supply to 12.1 vdc and then to 16.4 vdc. No computer failures shall occur.

LGC VOLTAGE FAIL ALARM LIMITS

41. Use CONTROL 1 to set +4 VDC LGC Power Supply voltage to 4.0 ( $\pm 0.20$ ) vdc. Use CONTROL 2 to set +14 VDC LGC Power Supply voltage to 14.0 ( $\pm 0.40$ ) vdc.

42. Press to extinguish INHIBIT COM-PUTER POWER FAIL pushbutton on Test Control panel.

43. Monitor CGC/LGC WARNING NO. 1 on Monitor panel while using CONTROL 1 and CONTROL 2 to set the 4 and 14 volt supplies to the values specified in steps a through d below. At each step a CGC/LGC WARNING NO. 1 shall occur. (Other failures may also occur but are to be ignored.) Return both power supplies to nominal values after each step and press RESET pushbutton on DSKY. All alarms shall go out within 60 seconds.

a. 3.5 vdc and 14.0 vdc

b. 4.6 vdc and 14.0 vdc

c. 4.0 vdc and 16.4 vdc

d. 4.0 vdc and 12.2 vdc

44. Set CONTROL 1 and CONTROL 2 switches to OFF.

45. Perform the following DSKY operations:

a. VERB 21 NOUN 27 ENTR

b. +00000 ENTR

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46. Upon completion of data sheets, make copies of data sheets and forward one set each immediately to:

Digital Development Group  
MS 35

Instrumentation Laboratory  
75 Cambridge Parkway  
Cambridge, Mass. 02142

and

IMU Thermo Design Group  
MS 99

Instrumentation Laboratory  
75 Cambridge Parkway  
Cambridge, Mass. 02142

DATE 15 MAR 66

APOLLO G&N  
EQUIPMENT TEST  
DATA SHEET 1 OF 3

JDC  
NO. 12615  
REV. H  
INITIAL TDRR 30271

JOB STANDBY CONTROL TEST

ASSEMBLY UNDER TEST				TEST HISTORY			
TITLE _____		DATE _____		START _____		END _____	
SER. NO. _____		DWG _____		REV. _____		SITE / LOCATION _____	
TIME _____		START _____		END _____		TOTAL ELAPSED _____	
MAJOR GROUND SUPPORT EQUIPMENT							
NAME _____		SER. NO. _____		CAL DATE _____			
NAME _____		SER. NO. _____		CAL DATE _____			
CONDUCTED BY _____		NAME/AFFILIATION _____		APPROVED BY _____		NAME/AFFILIATION _____	
JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ ACC	
9	Low 28 VDC IMU Standby Bus	volts	21.0		23.0		
14	Mean PIPA temp (one hour)	° F	129.0		132.0		
	Mean IRIG temp (one hour)	° F					
15	Mean Temperature Difference (absolute)	° F	0.0		3.0		
16	28 VDC IMU Standby Bus	volts	27.0		29.0		
17	28 VDC IMU Standby Bus	volts	27.0		29.0		

DATE 15 MAR 66

APOLLO G&N  
EQUIPMENT TEST  
DATA SHEET 2 OF 3

JDC  
NO. 12615  
REV. H

JOB STANDBY CONTROL TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ ACC
20	Counter Indication	counts	099968		100032	
21	3200 cps 28V feed-back voltage	volts	28.04		29.16	
26	CLOCK SYNC pulses Printout 1	cps	XXXXX2399700		XXXXX2400300	
	Printout 2	cps	XXXXX2399700		XXXXX2400300	
	Printout 3	cps	XXXXX2399700		XXXXX2400300	
	Printout 4	cps	XXXXX2399700		XXXXX2400300	
	Printout 5	cps	XXXXX2399700		XXXXX2400300	
	Printout 6	cps	XXXXX2399700		XXXXX2400300	
	Printout 7	cps	XXXXX2399700		XXXXX2400300	
	Printout 8	cps	XXXXX2399700		XXXXX2400300	
	Printout 9	cps	XXXXX2399700		XXXXX2400300	
29	Pulse Amplitude	volts	4.0		0.75	
	Pulse Width	µsec	0.25		0.75	
	Pulse Rise Time	µsec			0.2	
31	Maximum brightness (absolute)	v dc	4.09		4.73	
	Minimum brightness (absolute)	v dc			0.3	
32	+4 VDC LGC power supply	volts	+3.80		+4.20	
33	+14 VDC LGC power supply	volts	+13.6		+14.4	

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APOLLO GAN  
EQUIPMENT TEST  
DATA SHEET 3 OF 3

JDC  
NO. 12615  
REV. H

JOB STANDBY CONTROL TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ/ACC
40	No Fail Alarms					
43	Fail Alarms					
CALCULATIONS						
14	MEAN PIPA TEMP = Nominal PIPA TEMP + Deviation of Mean					
	Nominal PIPA TEMP Indicating set point (Chart zero) 130.00 degrees					
	Deviation of PIPA Mean.					
	$(\pm) \text{ No. MM (Between PIPA Mean \& chart zero) } X \left( \frac{V}{MM} \right) X \frac{2^\circ}{V} = (\pm) \text{ }^\circ$					
	MEAN PIPA TEMP (Line a + line b) $\text{ }^\circ$					
	MEAN IRIG TEMP = Nominal IRIG TEMP + Deviation of MEAN					
	Nominal IRIG TEMP Indicating set point (chart zero) 135.00 degrees					
	Deviation of IRIG Mean					
	$\pm \text{ No. MM (Between IRIG MEAN \& Chart Zero) } X \left( \frac{V}{MM} \right) X \frac{2^\circ}{V} = \pm (\pm) \text{ }^\circ$					
	MEAN IRIG TEMP (line d + line e) $\text{ }^\circ$					
15	Temp Difference = IRIG TEMP-PIPA TEMP					
	= line f - line c					
	Line f $\text{ }^\circ$					
	Line c $\text{ }^\circ$					
	Temp Difference (absolute) $\text{ }^\circ$					

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NOTE: If the control does not vary the voltage in the next step, set CONTROL 1 switch to OFF; turn CONTROL 1 fully counterclockwise and back to midrange; set CONTROL 1 switch to ON, and then readjust.

36. Set VOLTAGE SELECT switch to AGC (+4V)+3V and adjust CONTROL 1 for 4.0 (+0.20) vdc.

NOTE: If the control does not vary the voltage in the next step, set CONTROL 2 switch to OFF; turn CONTROL 2 fully counterclockwise and back to midrange; set CONTROL 2 switch to ON, and then readjust.

37. Set VOLTAGE SELECT switch to AGC (+14V)+13V and adjust CONTROL 2 for 14.0 (+0.40) vdc.

38. Perform the following DSKY operations:  
a. VERB 21 NOUN 27 ENTR  
b. 77767 ENTR  
39. Set CROSSBAR CONTROL on Primary Signal Selector panel to 194 to monitor the +4 VDC LGC Power Supply voltage on DVM.  
40. Use CONTROL 1 to adjust +4 VDC LGC Power Supply voltage to 3.40 vdc.  
Use CONTROL 2 to adjust +14 VDC LGC Power Supply voltage to 12.1 vdc and to

16.4 vdc. Use CONTROL 1 again to adjust the 4 volt supply to 4.60 vdc. Use CONTROL 2 to adjust the 14 volt supply to 12.1 vdc and then to 16.4 vdc. No computer failures shall occur.

LGC VOLTAGE FAIL ALARM LIMITS  
41. Use CONTROL 1 to set +4 VDC LGC Power Supply voltage to 4.0 (+0.20) vdc.  
Use CONTROL 2 to set +14 VDC LGC Power Supply voltage to 14.0 (+0.40) vdc.

42. Press to extinguish INHIBIT COM-PUTER POWER FAIL pushbutton on Test Control panel.

43. Monitor CGC/LGC WARNING NO. 1 on Monitor panel while using CONTROL 1 and CONTROL 2 to set the 4 and 14 volt supplies to the values specified in steps a through d below. At each step a CGC/LGC WARNING NO. 1 shall occur. (Other failures may also occur but are to be ignored.) Return both power supplies to nominal values after each step and press RESET pushbutton on DSKY. All alarms shall go out within 60 seconds.  
a. 3.5 vdc and 14.0 vdc  
b. 4.6 vdc and 14.0 vdc  
c. 4.0 vdc and 16.4 vdc  
d. 4.0 vdc and 12.2 vdc

44. Set CONTROL 1 and CONTROL 2 switches to OFF.  
45. Perform the following DSKY operations:  
a. VERB 21 NOUN 27 ENTR  
b. +00000 ENTR

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46. Upon completion of data sheets, make copies of data sheets and forward one set each immediately to:

Digital Development Group  
MS 35  
Instrumentation Laboratory  
75 Cambridge Parkway  
Cambridge, Mass. 02142  
and  
IMU Thermo Design Group  
MS 99  
Instrumentation Laboratory  
75 Cambridge Parkway  
Cambridge, Mass. 02142

DATE 15 MAR 66

APOLLO G&N  
EQUIPMENT TEST  
DATA SHEET 1 OF 3

JOB STANDBY CONTROL TEST

JDC  
NO. 12615  
REV. J  
INITIAL TORR 30271

ASSEMBLY UNDER TEST		TEST HISTORY			
TITLE		DATE	START	END	SITE / LOCATION
SER. NO.	DWG	REV.	TIME	START	END
MAJOR GROUND SUPPORT EQUIPMENT					
NAME	SER. NO.	CAL DATE			
NAME	SER. NO.	CAL DATE			
CONDUCTED BY			APPROVED BY		
JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE
9	Low 28 VDC IMU Standby Bus	volts	21.0		23.0
14	Mean PIPA temp (one hour)	° F	129.0		132.0
	Mean IRIG temp (one hour)	° F			
15	Mean Temperature Difference (absolute)	° F	0.0		3.0
16	28 VDC IMU Standby Bus	volts	27.0		29.0
17	28 VDC IMU Standby Bus	volts	27.0		29.0

DATE 15 MAR 66

APOLLO G&N  
EQUIPMENT TEST  
DATA SHEET 2 OF 3

JOB STANDBY CONTROL TEST

JDC  
NO. 12615  
REV. J

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ ACC
20	Counter indication	counts	099968		100032	
21	3200 cps 28V feed-back voltage	volts	28.04		28.16	
26	CLOCK SYNC pulses Printout 1	cps	XXXX2399700		XXXX2400300	
	Printout 2	cps	XXXX2399700		XXXX2400300	
	Printout 3	cps	XXXX2399700		XXXX2400300	
	Printout 4	cps	XXXX2399700		XXXX2400300	
	Printout 5	cps	XXXX2399700		XXXX2400300	
	Printout 6	cps	XXXX2399700		XXXX2400300	
	Printout 7	cps	XXXX2399700		XXXX2400300	
	Printout 8	cps	XXXX2399700		XXXX2400300	
	Printout 9	cps	XXXX2399700		XXXX2400300	
29	Pulse Amplitude	volts	4.0			
	Pulse Width	μsec	0.25		0.75	
	Pulse Rise Time	μsec			0.2	
11	Maximum brightness (absolute)	v dc	4.09		4.73	
	Minimum brightness (absolute)	v dc			0.3	
32	+4 VDC LGC power supply	volts	+3.80		+4.20	
33	+14 VDC LGC power supply	volts	+13.6		+14.4	

DATE 15 MAR 66

APOLLO G&N  
EQUIPMENT TEST  
DATA SHEET 3 OF 3

JDC  
NO. 12615  
REV. J

JOB STANDBY CONTROL TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ AC
40	No Fail Alarms					
43	Fail Alarms					
CALCULATIONS						
14	<p>MEAN PIPA TEMP = Nominal PIPA TEMP + Deviation of Mean</p> <p>Nominal PIPA TEMP indicating set point (Chart zero) 130.00 degrees</p> <p>Deviation of PIPA Mean.</p> <p>(+) No. MM (Between PIPA Mean &amp; chart zero) <math>X( \frac{V}{MM} \times \frac{2^0}{V} = (+) \dots</math></p> <p>MEAN PIPA TEMP (line a + line b) <math>\dots</math></p> <p>MEAN IRIG TEMP = Nominal IRIG TEMP + Deviation of MEAN</p> <p>Nominal IRIG TEMP indicating set point (chart zero) 135.00 degrees</p> <p>Deviation of IRIG Mean</p> <p>± No. MM (Between IRIG MEAN &amp; Chart Zero) <math>X( \frac{V}{MM} \times \frac{2^0}{V} = + (+) \dots</math></p> <p>MEAN IRIG TEMP (line d + line e) <math>\dots</math></p>					
15	<p>Temp Difference = IRIG TEMP-PIPA TEMP</p> <p>= line f - line c</p> <p>Line f <math>\dots</math></p> <p>Line c <math>\dots</math></p> <p>Temp Difference (absolute) <math>\dots</math></p>					

DATE 15 MAR 68





SUBSYSTEM LEM G & N SYSTEM ASSY

NOTE: If the control does not vary the voltage in the next step, set CONTROL 1 switch to OFF; turn CONTROL 1 fully counterclockwise and back to midrange; set CONTROL 1 switch to ON, and then readjust.

36. Set VOLTAGE SELECT switch to AGC (+14V)+3V and adjust CONTROL 1 for 4.0 (±0.20) vdc.

NOTE: If the control does not vary the voltage in the next step, set CONTROL 2 switch to OFF; turn CONTROL 2 fully counterclockwise and back to midrange; set CONTROL 2 switch to ON, and then readjust.

37. Set VOLTAGE SELECT switch to AGC (+14V)+13V and adjust CONTROL 2 for 14.0 (±0.40) vdc.

38. Perform following DSKY operations:

a. VERB 21 NOUN 01 ENTR

b. Observe:

VERB 21 NOUN 01 Flashing

c. 01357

d. 00000

e. VERB 21 NOUN 01 ENTR

f. Observe:

VERB 21 NOUN 01 Flashing

g. 01361

h. 00000

i. NOUN 15 ENTR

DATE 15 MAR 66

SUBSYSTEM LEM G & N SYSTEM ASSY

43. Monitor CGC/LGC WARNING NO. 1 on Monitor panel while using CONTROL 1 and CONTROL 2 to set the 4 and 14 volt supplies to the values specified in steps a through d below. At each step a CGC/LGC WARNING NO. 1 shall occur. (Other failures may also occur but are to be ignored.)

Return both power supplies to nominal values after each step and press RESET pushbutton on DSKY. All alarms shall go out within 60 seconds.

a. 3.5 vdc and 14.0 vdc

b. 4.6 vdc and 14.0 vdc

c. 4.0 vdc and 16.4 vdc

d. 4.0 vdc and 12.2 vdc

44. Set CONTROL 1 and CONTROL 2 switches to OFF.

45. Perform the following DSKY operations:

a. VERB 21 NOUN 27 ENTR

b. +00000

46. Upon completion of data sheets, make copies of data sheets and forward one set each immediately to:

Digital Development Group

MS 35

Instrumentation Laboratory

75 Cambridge Parkway

Cambridge, Mass. 02142

DATE 15 MAR 66

JOB STANDBY CONTROL TEST

ASSEMBLY UNDER TEST DATE START END SITE / LOCATION SER. NO. DWG REV TIME START END TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT NAME SER. NO. CAL DATE NAME SER. NO. CAL DATE

CONDUCTED BY NAME/AFFILIATION APPROVED BY NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ ACC
9	Low 28 VDC IMU Standby Bus	volts	21.0		23.0	
14	Mean PIPA temp (one hour)	° F	129.0		132.0	
	Mean IRIG temp (one hour)	° F				
15	Mean Temperature Difference (absolute)	° F	0.0		3.0	
16	28 VDC IMU Standby Bus	volts	27.0		29.0	
17	28 VDC IMU Standby Bus	volts	27.0		29.0	

DATE 15 MAR 66

FORM 1 (10-65) 11-7-65

JOB STANDBY CONTROL TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ ACC
20	Counter Indication	counts	099968		100032	
21	3200 cps 28V feed-back voltage	volts	28.04		29.16	
26	CLOCK SYNC pulses Printout 1	cps	XXXXX2399700		XXXXX2400300	
	Printout 2	cps	XXXXX2399700		XXXXX2400300	
	Printout 3	cps	XXXXX2399700		XXXXX2400300	
	Printout 4	cps	XXXXX2399700		XXXXX2400300	
	Printout 5	cps	XXXXX2399700		XXXXX2400300	
	Printout 6	cps	XXXXX2399700		XXXXX2400300	
	Printout 7	cps	XXXXX2399700		XXXXX2400300	
	Printout 8	cps	XXXXX2399700		XXXXX2400300	
	Printout 9	cps	XXXXX2399700		XXXXX2400300	
29	Pulse Amplitude	volts	4.0			
	Pulse Width	μsec	0.25		0.75	
	Pulse Rise Time	μsec			0.2	
31	Reticle lamp voltage (maximum)	vac	2.14		2.46	
31A	Reticle lamp voltage decreases		-3.9		-4.5	
31B	Reticle lamp voltage (minimum)	vac			0.15	
32	+4 VDC LGC power supply	volts	+3.80		+4.20	
33	+14 VDC LGC power supply	volts	+13.6		+14.4	

DATE 15 MAR 66

FORM 1 (10-65) 11-7-65

APOLLO GAN  
EQUIPMENT TEST  
DATA SHEET 3 OF 3

JDC  
NO. 12615  
REV. K

JOB STANDBY CONTROL TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ. ACC.
40	No Fail Alarms					
43	Fail Alarms					
CALCULATIONS						
14	MEAN PIPA TEMP = Nominal PIPA TEMP + Deviation of Mean Nominal PIPA TEMP indicating set point (Chart zero) 130.00 degrees Deviation of PIPA Mean. (±) No. MM (Between PIPA Mean & chart zero) $X(\frac{V}{MM} \times \frac{2^\circ}{V} = (\pm) \quad \circ$ MEAN PIPA TEMP (line a + line b) $\quad \circ$ MEAN IRIG TEMP = Nominal IRIG TEMP + Deviation of MEAN Nominal IRIG TEMP indicating set point (chart zero) 135.00 degrees Deviation of IRIG Mean (±) No. MM (Between IRIG MEAN & Chart Zero) $X(\frac{V}{MM} \times \frac{2^\circ}{V} = + (\pm) \quad \circ$ MEAN IRIG TEMP (line d + line e) $\quad \circ$					
15	Temp Difference = IRIG TEMP-PIPA TEMP = line f - line c Line f $\quad \circ$ Line c $\quad \circ$ Temp Difference (absolute) $\quad \circ$					

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6-0117  
CN. 7-23-63



## JOB STANDBY CONTROL TEST

SUBSYSTEM LEM G & N SYSTEM  
DESCRIPTION Provide a Standby Control Test for Low Bus Temperature Control, 3200 Suspension Power, Master Clock Sync, +4 VDC LGC Power Supply, +14 VDC LGC Power Supply, Reticle Lamp Voltage, LGC +4 VDC Voltage Margin, and LGC +14 VDC Voltage Margin.

Rev.	Date	TDRR NO.	PAGES REVISED	APPROVAL	REFERENCES
1	6-7-66	29400	1, 2, 3, 4, 7	M7	PS 6015000
2	7-21-66	30271	1, 2, 5	MM	ACM
3	8-4-66	30517	1, 2	EA	MB
4	11-10-66	31901	2, 3, 4, 6	EA	
5	11-25-66	32061	4, 5	EA	
6	7-27-67	34233	1	EA	
7	8-31-67	34455	1, 4-6	EA	
8	2-15-68	35625	1, 2, 3, 4, 5	EA	
9	3-28-68	35980	1, 2, 3	EA	
10	3-21-69	37440	3, 4, 5	EA	
11	5-26-70	38137	1	EA	

IMPORTANT: 1. Insure that connector assembly (2003089) or Restart Monitor module (2888989) is removed and W226-P1 is connected to the LGC test connector before proceeding with this JDC.

2. Oscilloscope sensitivities in this JDC are nominal values to be used only as a guide. Operator may change sensitivities as required.

3. Press the CGC/LGC POWER ON and the 400 CPS POWER ON pushbuttons to apply power to the LGC and provide power for DSKY illumination. The pushbuttons shall light.

4. Insure STBY condition lamp on the DSKY is lighted. If STBY condition lamp is not lighted, ignore alarms which may be present enter VERB 36 and press RSET pushbutton on DSKY; press ALARM RESET pushbutton on Programmer and Monitor panel; and perform the following DSKY operations:

a. VERB 21 NOUN 10 ENTR

## INITIALIZATION

1. Insure that the LEM and G/N TEST CONFIG indicators on the Monitor panel are lighted and that the AUX HTR PWR indicator

VERIFICATION WITH SID REQUIRED BEFORE USE

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FORM 0-14-1  
Chg. 1 - 8-64

## SUBSYSTEM LEM G &amp; N SYSTEM

## ASSY

28 VDC IMU STANDBY BUS

17. Set the CROSSBAR CONTROL to 120. Measure and record the voltage indicated on the DVM.

3200 CPS SUSPENSION POWER

18. Set switches and controls on the Counter as follows:

DISPLAY TIME (N<sub>1</sub>) to 10<sup>5</sup>

DISPLAY RESET to ZERO

CLOCK FREQUENCY DIVIDER to 10

CLOCK SELECTOR to INT

FUNCTION to OFF

INPUT SELECTOR to C SENSE

SENSE SELECTOR to FWD

TRIGGER VOLTAGE ATTN D to 10

TRIGGER VOLTAGE to fully counter-

clockwise

SAMPLE TIME (N<sub>1</sub>) to 032000

FUNCTION to RATIO OR PERIOD.

19. Set the COUNTER INPUT "D" SIG-

NAL selector on the Primary Signal Selec-

tor panel to 5. Insure that the D SIGNAL

pushbutton is lighted.

20. Adjust the ATTN D selector on the

Counter to the highest level that will cause

triggering. Set the corresponding TRIGGER

VOLTAGE control to insure that the Counter

starts and subsequently stops in approxi-

mately 10 seconds. The Counter shall indi-

cate approximately 100000.

Record the Counter Indication.

21. Set the CROSSBAR CONTROL on the

Primary Signal Selector panel to 123.

Measure and record the 3200 cps 28V feed-

back voltage indicated on the DVM.

MASTER CLOCK SYNC

NOTE: Ignore step 22 if Auxiliary Calibration System is to be used.

22. Insure that JDC 04830 has been performed within the past seven days.

23. Set Electronic Counter controls as follows:

FUNCTION switch to FREQ.

INPUT VOLTS RMS switch to 6

SLOPE switch to +

GATE switch to OPEN

TRIGGER LEVEL switch to CENTER.

24. Set the FREQ-TIME switch on the

Electronic Counter to the 100-second posi-

tion (first setting from fully counterclock-

wise).

25. Connect cable W259-P6 to W232-P4

and connect cable W259-P1 to COUNTER

connector on Control and Interface panel.

Connect P4 and P6 of cable W259 to J7 and

J8 on Buffer Assembly, connect P2 and P3

of cable W259 to SIGNAL HI and SIGNAL LO

on Digital Ohmmeter.

26. Select an INPUT VOLTS RMS switch

position on the Electronic Counter where the

TRIGGER LEVEL can be properly adjusted.

Set the TRIGGER LEVEL to the center of the

counting range. Set the GATE switch to

AUTO. Insure that printer power is set to

DATE 15 MAR 66

## SUBSYSTEM LEM G &amp; N SYSTEM

## ASSY

b. 00013 ENTR

c. 02000 ENTR

d. Press and hold PRO (or STBY) pushbut-

ton until STBY condition lamp lights.

5. Insure the PROCEED portion of the

PROCEED/ISS STANDBY pushbutton on the

Test Control panel is lighted.

6. Set up the Oscilloscope as follows:

a. Set CHANNELS 3 and 4 of the Oscillo-

graph Signal Selector panel to monitor

the following signals:

1. PIPA Standby Temperature devia-

tion CHANNEL 3-3.

2. IRIG Standby Temperature devia-

tion CHANNEL 4-3.

b. Insure that the CH 3 DC and

CH 4 DC pushbuttons on the Oscil-

lograph Signal Selector panel are

lighted.

c. Zero and calibrate CHANNELS 3 and 4

on the Oscilloscope Amplifier, setting

the CHART SPEEDS to 1 and the Range

to .05 V/MM on the DC Amplifier

for CHANNEL 3 and .2 V/MM on the

DC Amplifier for CHANNEL 4.

d. Mark the Oscilloscope Channels as

follows:

1. CHANNEL 3 "start of Standby PIPA

TEMP test."

2. CHANNEL 4 "start of Standby IRIG

TEMP test."

7. Start the oscilloscope by setting the

CHART DRIVE switch to MM/SEC.

8. Press the PROCEED/ISS STANDBY

pushbutton. The PROCEED lamp shall go

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out and the ISS STANDBY lamp shall light.

Immediately press the EVENT MARKER on

the Oscilloscope Control panel.

NOTE: CGC/LGC WARNING

NO. 1 may light in step 9.

Ignore indication.

9. Set the CROSSBAR CONTROL on the

Primary Signal Selector panel to 172. Adjust

the G & N POWER ADJUST on the Test Con-

trol Panel until the DVM indicates 22.0 (±1.0)

vdc. Record indications.

10. Insure that the PSA HTR PWR lamp on the

Temperature Monitor Control Panel is lighted.

11. Observe the Monitor panel to con-

firm that the ERROR DETECT indicator and

ALARM INHIBITED pushbuttons are not lighted.

12. Observe the Temperature Monitor

Control panel to confirm that the failure

lights are not lighted.

13. After one hour has elapsed since

performing step 8, press the EVENT

MARKER on the Oscilloscope Control panel

and stop the Oscilloscope.

14. Determine from the Oscilloscope

chart and by use of the calculation sheet,

the mean temperature of the IRIG's and

PIPA's during the one hour period.

Record results.

15. Calculate and record the difference

between the IRIG and PIPA temperatures

determined in step 14.

16. Set the CROSSBAR CONTROL to

172. Adjust the G & N POWER ADJUST

control on the Test Control panel until

the DVM indicates 28.0 (±1.0) vdc. Record

indications.

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## JOB STANDBY CONTROL TEST

## JDC 12615 REV. 1, PAGE 4 OF 6

## SUBSYSTEM LEM G &amp; N SYSTEM

## ASSY

ON and the printer is in Record Mode. Read

the frequency directly in CPS. Count output

frequency for 15 minutes and record data

from the printout.

27. Disconnect cable W259 P1 from the

Counter connector and connect it directly to

the vertical input of the Oscilloscope.

28. Deleted.

29. Measure and record the following

characteristics on the Computer Test Set

Oscilloscope:

a. Amplitude: measured from reference

to pulse maximum positive level

b. Width at 50% of amplitude

c. Rise time at 10 to 90% amplitude.

30. Perform the following DSKY and CTS

operations:

a. Press and hold PRO (or STBY) pushbut-

ton until STBY indicator goes out.

b. VERB 36 ENTR

c. Press RSET pushbutton.

d. Press ALARM RESET pushbutton on

Programmer and Monitor panel of CTS.

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## RETICLE LAMP VOLTAGE

31. Set CROSSBAR CONTROL on Primary

Signal Selector panel to 169. Measure and

record the ac and dc portions of the reticle

lamp voltage with the INCR RETICLE

BRIGHTNESS control on the Computer Con-

trol and Reticle Dimmer (CCRD) assembly

set to maximum.

31A. Verify and record that the dc voltage

decreases when the INCR RETICLE BRIGHT-

NESS control is rotated to the minimum

position.

31B. Measure and record the ac and dc

portions of the reticle lamp voltage with the

INCR RETICLE BRIGHTNESS control set to

minimum.

+4 VDC LGC POWER SUPPLY

32. Set CROSSBAR CONTROL on Primary

Signal Selector panel to 194. Measure and

record +4 VDC LGC Power Supply voltage

indicated on DVM.

+14 VDC LGC POWER SUPPLY

33. Set CROSSBAR CONTROL to 283.

Measure and record +14 VDC LGC Power

Supply voltage indicated on DVM.

LGC VOLTAGE MARGIN TEST

34. Press to light INHIBIT COMPUTER

POWER FAIL pushbutton on Test Control

panel.

35. Set AGC VOLTAGE 1 and 2 controls

on CTS Power Control panel to midrange and

set CONTROL 1 and CONTROL 2 switches to

ON.

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SUBSYSTEM LEM G &amp; N SYSTEM ASSY

NOTE: If the control does

not vary the voltage in the next step, set CONTROL 1 switch to OFF; turn CONTROL 1 fully counterclockwise and back to midrange; set CONTROL 1 switch to ON, and then readjust.

36. Set VOLTAGE SELECT switch to AGC (+4V)+3V and adjust CONTROL 1 for 4.0 (±0.20) vdc.

NOTE: If the control does not vary the voltage in the next step, set CONTROL 2 switch to OFF; turn CONTROL 2 fully counterclockwise and back to midrange; set CONTROL 2 switch to ON, and then readjust.

37. Set VOLTAGE SELECT switch to AGC (+4V)+13V and adjust CONTROL 2 for 14.0 (±0.40) vdc.

38. Perform following DSKY operations:

a. VERB 21 NOUN 01 ENTR

b. Observe:

VERB 21 NOUN 01 Flashing

c. 01357 ENTR

d. 00000 ENTR

e. VERB 21 NOUN 01 ENTR

f. Observe:

VERB 21 NOUN 01 Flashing

g. 01361 ENTR

h. 00000 ENTR

i. NOUN 15 ENTR

j. Observe:

VERB 21 NOUN 15 Flashing

k. 00000 ENTR ENTR

l. 00000 ENTR ENTR

m. 00000 ENTR ENTR

n. 00000 ENTR ENTR

o. 00000 ENTR ENTR

p. 00000 ENTR ENTR

q. 00000 ENTR ENTR

r. VERB 21 NOUN 27 ENTR

s. Observe:

VERB 21 NOUN 27 Flashing

t. 00010 ENTR

39. Set CROSSBAR CONTROL on Primary Signal Selector panel to 194 to monitor the +4 VDC LGC Power Supply voltage on DVM.

40. Use CONTROL 1 to adjust +4 VDC LGC Power Supply voltage to 3.40 vdc.

Use CONTROL 2 to adjust +14 VDC LGC

Power Supply voltage to 12.1 vdc and to

16.4 vdc. Use CONTROL 1 again to adjust

the 4 volt supply to 4.60 vdc. Use CONTROL

2 to adjust the 14 volt supply to 12.1 vdc and

then to 16.4 vdc. No computer failures shall

occur.

LGC VOLTAGE FAIL ALARM LIMITS

41. Use CONTROL 1 to set +4 VDC LGC

Power Supply voltage to 4.0 (±0.20) vdc.

Use CONTROL 2 to set +14 VDC LGC Power

Supply voltage to 14.0 (±0.40) vdc.

42. Press to extinguish INHIBIT COM-

PUTER POWER FAIL pushbutton on Test

Control panel.

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# APOLLO G&N EQUIPMENT TEST DATA SHEET 1 OF 3

JOB STANDBY CONTROL TEST

JDC  
NO. 12615  
REV. L  
INITIAL TDRR 27134

ASSEMBLY UNDER TEST

TITLE

SER. NO.

DWG

REV.

TEST HISTORY

DATE

TIME

START

END

SITE / LOCATION

TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT

NAME

SER. NO.

CAL DATE

NAME

SER. NO.

CAL DATE

CONDUCTED BY

NAME/AFFILIATION

APPROVED BY

NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ AC
9	Low 28 VDC IMU Standby Bus	volts	21.0		23.0	
14	Mean PIPA temp (one hour)	° F	129.0		132.0	
	Mean IRIG temp (one hour)	° F				
15	Mean Temperature Difference (absolute)	° F	0.0		3.0	
16	28 VDC IMU Standby Bus	volts	27.0		29.0	
17	28 VDC IMU Standby Bus	volts	27.0		29.0	

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FORM 101-6  
Chg. 7-23-65

SUBSYSTEM LEM G &amp; N SYSTEM ASSY

43. Monitor CGC/LGC WARNING NO. 1 on Monitor panel while using CONTROL 1 and CONTROL 2 to set the 4 and 14 volt supplies to the values specified in steps a through d below. At each step a CGC/LGC WARNING NO. 1 shall occur. (Other failures may also occur but are to be ignored.) Return both power supplies to nominal values after each step and press RSET pushbutton on DSKY. All alarms shall go out within 60 seconds.

a. 3.5 vdc and 14.0 vdc

b. 4.6 vdc and 14.0 vdc

c. 4.0 vdc and 16.4 vdc

d. 4.0 vdc and 12.2 vdc

44. Set CONTROL 1 and CONTROL 2 switches to OFF.

45. Perform the following DSKY operations:

a. VERB 21 NOUN 27 ENTR

b. +00000 ENTR

46. Upon completion of data sheets, make

copies of data sheets and forward one set

each immediately to:

Digital Development Group

MS 35

Instrumentation Laboratory

75 Cambridge Parkway

Cambridge, Mass. 02142

and

IMU Thermo Design Group

MS 99

Instrumentation Laboratory

75 Cambridge Parkway

Cambridge, Mass. 02142

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# APOLLO G&N EQUIPMENT TEST DATA SHEET 2 OF 3

JOB STANDBY CONTROL TEST

JDC  
NO. 12615  
REV. L

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ ACC
20	Counter indication	counts	099968		100032	
21	3200 cps 28V feed-back voltage	volts	28.04		29.16	
26	CLOCK SYNC pulses Printout 1	cps	XXXXX2399700		XXXXX2400300	
	Printout 2	cps	XXXXX2399700		XXXXX2400300	
	Printout 3	cps	XXXXX2399700		XXXXX2400300	
	Printout 4	cps	XXXXX2399700		XXXXX2400300	
	Printout 5	cps	XXXXX2399700		XXXXX2400300	
	Printout 6	cps	XXXXX2399700		XXXXX2400300	
	Printout 7	cps	XXXXX2399700		XXXXX2400300	
	Printout 8	cps	XXXXX2399700		XXXXX2400300	
	Printout 9	cps	XXXXX2399700		XXXXX2400300	
29	Pulse Amplitude	volts	4.0			
	Pulse Width	μ sec	0.25		0.75	
	Pulse Rise Time	μ sec			0.2	
31	Reticle lamp voltage (maximum)	vdc	2.14		2.46	
		vdc	-3.9		-4.5	
31A	Reticle lamp voltage decreases					
31B	Reticle lamp voltage (minimum)	vdc			0.15	
		vdc			-0.26	
32	+4 VDC LGC power supply	volts	+3.80		+4.20	
33	+14 VDC LGC power supply	volts	+13.6		+14.4	

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FORM 101-6  
Chg. 7-23-65

APOLLO G&N  
EQUIPMENT TEST  
DATA SHEET 3 OF 3

JDC  
NO. 12615  
REV. L

JOB STANDBY CONTROL TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ ACC
40	No Fail Alarms					
48	Fail Alarms					
CALCULATIONS						
14	<p>MEAN PIPA TEMP = Nominal PIPA TEMP + Deviation of Mean</p> <p>Nominal PIPA TEMP indicating set point (Chart Zero) 130.00 degrees</p> <p>Deviation of PIPA Mean.</p> <p>(±) No. MM (Between PIPA Mean &amp; chart zero) <math>X( ) \frac{V}{MM} X \frac{2^{\circ}}{V} = (\pm)</math> °</p> <p>MEAN PIPA TEMP (line a + line b) _____ °</p> <p>MEAN IRIG TEMP = Nominal IRIG TEMP + Deviation of MEAN</p> <p>Nominal IRIG TEMP indicating set point (chart zero) 135.00 degrees</p> <p>Deviation of IRIG Mean</p> <p>± No. MM (Between IRIG MEAN &amp; Chart Zero) <math>X( ) \frac{V}{MM} X \frac{2^{\circ}}{V} = + (\pm)</math> °</p> <p>MEAN IRIG TEMP (line d + line e) _____ °</p>					
15	<p>Temp Difference = IRIG TEMP-PIPA TEMP</p> <p>= line f - line c</p> <p>Line f _____ °</p> <p>Line c _____ °</p> <p>Temp Difference (absolute) _____ °</p>					

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SUBSYSTEM LEM G & N SYSTEM  
DESCRIPTION Provide a Standby Control Test for Low Bus Temperature Control. 3200 Suspension Power, Master Clock Sync, +4 VDC LGC Power Supply, +14 VDC LGC Power Supply, Reticle Lamp Voltage, LGC +4 VDC Voltage Margin, and LGC +14 VDC Voltage Margin.

Rev.	Date	TDRR NO.	PAGES REVISED	APPROVAL	REFERENCES
1	6-7-66	29400	1, 2, 3, 4, 7	M17	NASA
2	7-1-66	30271	1, 2, 5	MM	ACM
3	8-4-66	30517	1, 2	EA	MB
4	11-10-66	31901	2, 3, 4, 6	EA	-
5	11-25-66	32061	4, 5	EA	-
6	7-27-67	34233	1	EA	VS
7	8-31-67	34455	1, 4-6	EA	VS
8	2-15-68	35625	1, 2, 3, 4, 5	EA	VS
9	3-23-68	35930	1, 2, 3, 4, 5	EA	VS
10	3-21-68	37440	3, 4, 5	EA	VS
11	5-26-70	38137	1	EA	VS
12	7-6-70	38176	1, 5	EA	VS

IMPORTANT: 1. Insure that connector assembly (2003089) or Restart Monitor module (2898989) is removed and W226-P1 is connected to the LGC test connector before proceeding with this JDC.

2. Oscilloscope sensitivities in this JDC are nominal values to be used only as a guide. Operator may change sensitivities as required.

3. Press the CCG/LGC POWER ON and the 400 CPS POWER ON pushbuttons to apply power to the LGC and provide power for DSK? illumination. The pushbuttons shall light.

4. Insure STBY condition lamp on the DSK? is lighted. If STBY condition lamp is not lighted, ignore alarms which may be present enter VERB 36 and press RESET pushbutton on DSKY; press ALARM RESET pushbutton on Programmer and Monitor panel; and perform the following DSKY operations:

a. VERB 21 NOUN 10 ENTR

#### INITIALIZATION

1. Insure that the LEM and G/N TEST CONFIG indicators on the Monitor panel are lighted and that the AUX HTR PWR indicator

VERIFICATION WITH SID REQUIRED BEFORE USE

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28 VDC IMU STANDBY BUS  
17. Set the CROSSBAR CONTROL to 120. Measure and record the voltage indicated on the DVM.

#### 3200 CPS SUSPENSION POWER

18. Set switches and controls on the Counter as follows:  
DISPLAY TIME (N<sub>2</sub>) to 10<sup>5</sup>  
CLOCK RESET to ZERO  
CLOCK FREQUENCY DIVIDER to 10  
CLOCK SELECTOR to INT  
FUNCTION to OFF  
INPUT SELECTOR to C SENSE  
SENSE SELECTOR to FWD  
TRIGGER VOLTAGE ATTN D to 10  
TRIGGER VOLTAGE to fully counter-clockwise

SAMPLE TIME (N<sub>1</sub>) to 032000  
FUNCTION to RATIO OR PERIOD.  
19. Set the COUNTER INPUT "D" SIGNAL selector on the Primary Signal Selector panel to 5. Insure that the D SIGNAL pushbutton is lighted.

20. Adjust the ATTN D selector on the Counter to the highest level that will cause triggering. Set the corresponding TRIGGER VOLTAGE control to insure that the Counter starts and subsequently stops in approximately 10 seconds. The Counter shall indicate approximately 100000.  
Record the Counter indication.

21. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 123.

Measure and record the 3200 cps 28V feed back voltage indicated on the DVM.  
MASTER CLOCK SYNC  
NOTE: Ignore step 22 if Auxiliary Calibration System is to be used.

22. Insure that JDC 04830 has been performed within the past seven days.

23. Set Electronic Counter controls as follows:  
FUNCTION switch to FREQ.  
INPUT VOLTS RMS switch to 6.4  
SLOPE switch to +  
GATE switch to OPEN  
TRIGGER LEVEL switch to CENTER.

24. Set the FREQ-TIME switch on the Electronic Counter to the 100-second position (first setting from fully counterclockwise).

25. Connect cable W259-P6 to W232-P4 and connect cable W259-P1 to COUNTER connector on Control and Interface panel. Connect P4 and P5 of cable W259 to J7 and J8 on Buffer Assembly. connect P2 and P3 of cable W259 to SIGNAL HI and SIGNAL LO on Digital Ohmmeter.

26. Select an INPUT VOLTS RMS switch position on the Electronic Counter where the TRIGGER LEVEL can be properly adjusted. Set the TRIGGER LEVEL to the center of the counting range. Set the GATE switch to AUTO. Insure that printer power is set to

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b. 00013 ENTR  
c. 02000 ENTR  
d. Press and hold PRO (or STBY) pushbutton until STBY condition lamp lights.

5. Insure the PROCEED portion of the PROCEED/ISS STANDBY pushbutton on the Test Control panel is lighted.

6. Set up the Oscilloscope as follows:

a. Set CHANNELS 3 and 4 of the Oscilloscope Signal Selector panel to monitor the following signals:

1. PIPA Standby Temperature deviation CHANNEL 3-3.

2. IRIG Standby Temperature deviation CHANNEL 4-3.

b. Insure that the CH 3 DC and CH 4 DC pushbuttons on the Oscilloscope Signal Selector panel are lighted.

c. Zero and calibrate CHANNELS 3 and 4 on the Oscilloscope Amplifier, setting the CHART SPEEDS to 1 and the Range to .05 V/MM on the DC Amplifier for CHANNEL 3 and .2 V/MM on the DC Amplifier for CHANNEL 4.

d. Mark the Oscilloscope Channels as follows:

1. CHANNEL 3 "start of Standby PIPA TEMP test."

2. CHANNEL 4 "start of Standby IRIG TEMP test."

7. Start the oscilloscope by setting the CHART DRIVE switch to MM/SEC.

8. Press the PROCEED/ISS STANDBY pushbutton. The PROCEED lamp shall go

out and the ISS STANDBY lamp shall light. Immediately press the EVENT MARKER on the Oscilloscope Control panel.

NOTE: CCG/LGC WARNING NO. 1 may light in step 9.

Ignore indication.

9. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 172. Adjust the G & N POWER ADJUST on the Test Control Panel until the DVM indicates 22.0 (±1.0) vdc. Record indications.

10. Insure that the PSA HTR PWR lamp on the Temperature Monitor Control Panel is lighted.

11. Observe the Monitor panel to confirm that the ERROR DETECT indicator and ALARM INHIBITED pushbuttons are not lighted.

12. Observe the Temperature Monitor Control panel to confirm that the failure lights are not lighted.

13. After one hour has elapsed since performing step 8, press the EVENT MARKER on the Oscilloscope Control panel and stop the Oscilloscope.

14. Determine from the Oscilloscope chart and by use of the calculation sheet, the mean temperature of the IRIG's and PIPA's during the one hour period. Record results.

15. Calculate and record the difference between the IRIG and PIPA temperatures determined in step 14.

16. Set the CROSSBAR CONTROL to 172. Adjust the G & N POWER ADJUST control on the Test Control panel until the DVM indicates 28.0 (±1.0) vdc. Record indications.

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RETICLE LAMP VOLTAGE  
31. Set CROSSBAR CONTROL on Primary Signal Selector panel to 169. Measure and record the ac and dc portions of the reticle lamp voltage with the INCR RETICLE BRIGHTNESS control on the Computer Control and Reticle Dimmer (CCRD) assembly set to maximum.

31A. Verify and record that the dc voltage decreases when the INCR RETICLE BRIGHTNESS control is rotated to the minimum position.

31B. Measure and record the ac and dc portions of the reticle lamp voltage with the INCR RETICLE BRIGHTNESS control set to minimum.

+4 VDC LGC POWER SUPPLY  
32. Set CROSSBAR CONTROL on Primary Signal Selector panel to 194. Measure and record +4 VDC LGC Power Supply voltage indicated on DVM.

+14 VDC LGC POWER SUPPLY  
33. Set CROSSBAR CONTROL to 293. Measure and record +14 VDC LGC Power Supply voltage indicated on DVM.

LGC VOLTAGE MARGIN TEST  
34. Press to light INHIBIT COMPUTER POWER FAIL pushbutton on Test Control panel.

35. Set AGC VOLTAGE 1 and 2 controls on CTS Power Control panel to midrange and set CONTROL 1 and CONTROL 2 switches to ON.

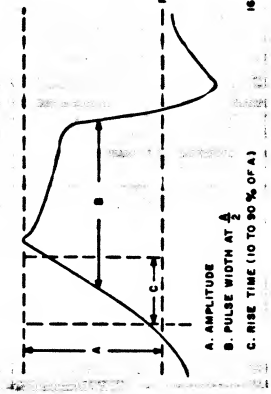
30. Perform the following DSKY and CTS operations:

a. Press and hold PRO (or STBY) pushbutton until STBY indicator goes out.

b. VERB 36 ENTR

c. Press RESET pushbutton.

d. Press ALARM RESET pushbutton on Programmer and Monitor panel of CTS.



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APOLLO 8&N  
EQUIPMENT TEST  
DATA SHEET 3 OF 3

JDC  
NO. 12615  
REV. M

JOB STANDBY CONTROL TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ ACC
40	No Fail Alarms					
43	Fail Alarms					
CALCULATIONS						
14	MEAN PIPA TEMP = Nominal PIPA TEMP + Deviation of Mean Nominal PIPA TEMP indicating set point (Chart zero) 130.00 degrees Deviation of PIPA Mean. (+) No. MM (Between PIPA Mean & chart zero) $\times \left( \frac{V}{MM} \times \frac{2^\circ}{V} \right) = (+)$					
	MEAN PIPA TEMP (line a + line b) _____ °					
	MEAN IRIG TEMP = Nominal IRIG TEMP + Deviation of MEAN					
	Nominal IRIG TEMP indicating set point (chart zero) 135.00 degrees					
	Deviation of IRIG Mean					
	± No. MM (Between IRIG MEAN & Chart Zero) $\times \left( \frac{V}{MM} \times \frac{2^\circ}{V} \right) = + (-)$ _____ °					
	MEAN IRIG TEMP (line d + line e) _____ °					
15	Temp Difference = IRIG TEMP-PIPA TEMP = line f - line c					
	Line f _____ °					
	Line c _____ °					
	Temp Difference (absolute) _____ °					

DATE 15 MAR 86







APOLLO G&N  
EQUIPMENT TEST  
DATA SHEET 3 OF 4

JDC  
NO. 12615  
REV. -

JOB STANDBY CONTROL TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ ACC
43	4V Low Margin Test	volts dc R2 other fail indica- tions				
47	4V Voltage Fail Alarm (low)	volts dc	3.55		3.65	
51	4V High Margin Test	volts dc R2 other fail indica- tions				
55	4V Voltage Fail Alarm (high)	volts dc	4.3		4.7	
59	14V Low Margin Test	volts dc R2 other fail indica- tions				
63	14V Voltage Fail Alarm (low)	volts dc	12.4		12.8	
67	14V High Margin Test	volts dc R2 other fail indica- tions				

DATE

FORM 001.7  
Chg. 7-53-65

APOLLO G&N  
EQUIPMENT TEST  
DATA SHEET 2 OF 4

JDC  
NO. 12615  
REV. -

JOB STANDBY CONTROL TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ ACC
20	Counter indication	counts	099968		100032	
21	3200 cps 28V feed- back voltage	volts	28.03		28.17	
26	CLOCK SYNC pulses Printout 1	cps	1023997		1024003	
	Printout 2	cps	1023997		1024003	
	Printout 3	cps	1023997		1024003	
	Printout 4	cps	1023997		1024003	
	Printout 5	cps	1023997		1024003	
	Printout 6	cps	1023997		1024003	
	Printout 7	cps	1023997		1024003	
	Printout 8	cps	1023997		1024003	
	Printout 9	cps	1023997		1024003	
29	Pulse Amplitude	vp-p	4.0			
	Pulse Width	μsec	0.25		0.75	
	Pulse Rise Time	μsec			0.2	
30	+4 VDC LGC power supply	volts	+3.65		+4.15	
31	+14 VDC LGC power supply	volts	+13.8		+14.2	
32	Maximum brightness	v. dc	4.09		4.73	
	Minimum brightness	v. dc			0.3	

DATE

FORM 001.7  
Chg. 7-53-65

APOLLO G&N  
EQUIPMENT TEST  
DATA SHEET 4 OF 4

JDC  
NO. 12615  
REV. -

JOB STANDBY CONTROL TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ ACC
71	14V Voltage Fail Test	volts dc	16.0		16.4	

DATE

FORM 001.7  
Chg. 7-53-65





## SUBSYSTEM LEM G &amp; N SYSTEM

ASSY

48. Release the IMU CAGE COMMAND pushbutton on the Test Control Panel and perform the following DSKY operations:

VERB 11 NOUN 10 ENTR  
00012 ENTR

49. Record the display of Row 1. INERTIAL TEMPERATURE CONTROL POINT

50. One hour after performing step 38, press the EVENT MARKER on the Oscillograph Control Panel, record the time, and stop the Oscillograph.

51. Record the following deviations:

a. The maximum and minimum voltage deviation on CHANNEL 3 between the voltages marked in step 38 to step 51.

b. The maximum and minimum voltage deviation on CHANNEL 4 between the voltage marked in step 38 to step 51.

## HEATER TELEMETRY DISCRETE

52. Record the maximum and minimum voltage indicated on CHANNEL 5.

## BLOWER TELEMETRY DISCRETE

53. Record the maximum and minimum voltage indicated on CHANNEL 6.

## NORMALIZATION

54. Upon completion of the data sheets, make a copy of the data sheets and forward one set immediately to:

IMU Thermo Design Group  
MS 99  
Instrumentation Laboratory  
75 Cambridge Parkway  
Cambridge, Massachusetts 02142

APOLLO G & N  
EQUIPMENT TEST

DATA SHEET 1 OF 3

JOB OPERATE CONTROL TEST

## ASSEMBLY UNDER TEST

TITLE \_\_\_\_\_ DATE \_\_\_\_\_ START \_\_\_\_\_ END \_\_\_\_\_ SITE / LOCATION \_\_\_\_\_  
SER. NO. \_\_\_\_\_ DWG \_\_\_\_\_ REV. \_\_\_\_\_ TIME \_\_\_\_\_ START \_\_\_\_\_ END \_\_\_\_\_ TOTAL ELAPSED \_\_\_\_\_

## MAJOR GROUND SUPPORT EQUIPMENT

NAME \_\_\_\_\_ SER. NO. \_\_\_\_\_ CAL DATE \_\_\_\_\_  
NAME \_\_\_\_\_ SER. NO. \_\_\_\_\_ CAL DATE \_\_\_\_\_

CONDUCTED BY \_\_\_\_\_ NAME/AFFILIATION \_\_\_\_\_ APPROVED BY \_\_\_\_\_ NAME/AFFILIATION \_\_\_\_\_

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES			MAX VALUE	REJ ACC
				1st	2nd*	3rd*		
6	DVM voltage	volts	27.75				28.25	
10	Row 1		5---				5---	
14	Elapsed time	sec	85				95	
15	Row 1		4---				4---	
18	Time	hr min						
28	Elapsed time	min	30					
31	Time	hr min						
32	PIPA torquing not present until after Display change							
35	OG Gimbal position							
	MG Gimbal position							
	IG Gimbal position							
	OG DSKY position							

\* TO BE USED AS REQUIRED OR DESIRED

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APOLLO G & N  
EQUIPMENT TEST

DATA SHEET 2 OF 3

JOB OPERATE CONTROL TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES			MAX VALUE	REJ ACC
				1st	2nd*	3rd*		
35 (cont)	MG DSKY position							
	IG DSKY position							
36	Cos A <sub>OG</sub> 1X	vrms	23.4				28.6	
	Cos A <sub>MG</sub> 1X	vrms	23.4				28.6	
	Cos A <sub>IG</sub> 1X	vrms	23.4				28.6	
	Sin A <sub>OG</sub> 1X	vrms	0.00				0.50	
	Sin A <sub>MG</sub> 1X	vrms	0.00				0.50	
	Sin A <sub>IG</sub> 1X	vrms	0.00				0.50	
38	Time	min						
39	IRIG temperature	volts	-1.0				+1.0	
40	PIPA temperature	volts	-1.0				+1.0	
41	PIPA STANDBY temperature	volts						
	Step 40 - step 41 =	volts					0.25	
42	800 CPS/PS temperature	ohms	12210				18,370	
43	Temp Mon 1	ohms	11400				23,250	
44	PIPA Cal. Mod.	ohms	13650				23,250	

\* TO BE USED AS REQUIRED OR DESIRED

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APOLLO G & N  
EQUIPMENT TEST

DATA SHEET 3 OF 3

JOB OPERATE CONTROL TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES			MAX VALUE	REJ ACC
				1st	2nd*	3rd*		
47	Sin A <sub>OG</sub> 1X	vrms	0.00				0.50	
	Sin A <sub>MG</sub> 1X	vrms	0.00				0.50	
	Sin A <sub>IG</sub> 1X	vrms	0.00				0.50	
49	Row 1 display		XXXXX				XXXXX	
50	Time	hr min						
51	Voltage Deviation Step 38 - Step 51 =     CHANNEL 3	vdc					0.200	
	Voltage Deviation Step 38 - Step 51 =     CHANNEL 4	vdc					0.200	
52	Maximum (ON state) CHANNEL 5 voltage	vdc	27				29	
	Minimum (OFF state) CHANNEL 5 voltage	vdc	0.00				5.0	
53	Maximum (OFF state) CHANNEL 6 voltage	vrms	25.9				30.1	
	Minimum (ON state) CHANNEL 6 voltage	vrms	0				5.0	

\* TO BE USED AS REQUIRED OR DESIRED

DATE 15 MAR 66





SUBSYSTEM LEM G & N SYSTEM

48. Release the IMU CAGE COMMAND pushbutton on the Test Control Panel and perform the following DSKY operations:

VERB 11 NOUN 10 ENTR  
00012 ENTR

49. Record the display of Row 1.

INERTIAL TEMPERATURE CONTROL POINT  
50. One hour after performing step 38, press the EVENT MARKER on the Oscillograph Control Panel, record the time, and stop the Oscillograph.

51. Record the following deviations:

a. The maximum and minimum voltage deviation on CHANNEL 3 between the voltages marked in step 38 to step 51.

b. The maximum and minimum voltage deviation on CHANNEL 4 between the voltage marked in step 38 to step 51.

HEATER TELEMETRY DISCRETE

52. Record the maximum and minimum voltage indicated on CHANNEL 5.

BLOWER TELEMETRY DISCRETE

53. Record the maximum and minimum voltage indicated on CHANNEL 6.

NORMALIZATION

54. Upon completion of the data sheets, make a copy of the data sheets and forward one set immediately to:

IMU Thermo Design Group  
MS 99  
Instrumentation Laboratory  
75 Cambridge Parkway  
Cambridge, Massachusetts 02142

DATE 15 MAR 66

APOLLO G & N

EQUIPMENT TEST

DATA SHEET 1 OF 3

JOB OPERATE CONTROL TEST

JDC NO. 12616 REV. B INITIAL TDRR 27134	
TEST HISTORY	
TITLE	DATE
SER. NO.	TIME
END	
TOTAL ELAPSED	
MAJOR GROUND SUPPORT EQUIPMENT	
NAME	SER. NO.
NAME	SER. NO.
NAME	CAL DATE
NAME	CAL DATE

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES	MAX VALUE	REJ ACC
				1st	2nd*	3rd*
6	DVM voltage	volts	27.75			28.25
10	Row 1		5			5
14	Elapsed time	sec	85			95
15	Row 1		4			4
13	Time	hr				
		min				
28	Elapsed time	min	30			
31	Time	hr				
		min				
32	PIPA torquing not present until after Display change					
35	OG Gimbal position					
	MG Gimbal position					
	IG Gimbal position					
	OG DSKY position					

\* TO BE USED AS REQUIRED OR DESIRED

DATE 15 MAR 66

APOLLO G & N

EQUIPMENT TEST

DATA SHEET 2 OF 3

JOB OPERATE CONTROL TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES	MAX VALUE	REJ ACC
				1st	2nd*	3rd*
35	MG DSKY position					
	IG DSKY position					
36	Cos A <sub>OG</sub> IX	vrms	23.4			28.6
	Cos A <sub>MG</sub> IX	vrms	23.4			28.6
	Cos A <sub>IG</sub> IX	vrms	23.4			28.6
	Sin A <sub>OG</sub> IX	vrms	0.00			0.50
	Sin A <sub>MG</sub> IX	vrms	0.00			0.50
	Sin A <sub>IG</sub> IX	vrms	0.00			0.50
38	Time	min				
39	IRIG temperature	volts	-1.0			+1.0
40	PIPA temperature	volts	-1.0			+1.0
41	PIPA STANDBY temperature	volts				
	Step 40 - step 41 =	volts				0.25
42	800 CPS/PS temperature	ohms	12210			18,370
43	Temp Mon 1	ohms	11400			23,250
44	PIPA Cal. Mod.	ohms	13650			23,250

\* TO BE USED AS REQUIRED OR DESIRED

DATE 15 MAR 66

APOLLO G & N

EQUIPMENT TEST

DATA SHEET 3 OF 3

JOB OPERATE CONTROL TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES	MAX VALUE	REJ ACC
				1st	2nd*	3rd*
47	Sin A <sub>OG</sub> IX	vrms	0.00			0.50
	Sin A <sub>MG</sub> IX	vrms	0.00			0.50
	Sin A <sub>IG</sub> IX	vrms	0.00			0.50
49	Row 1 display		XXXXXX			XXXXXX
50	Time	hr				
		min				
51	Voltage Deviation Step 38 - Step 51 =	vdc				0.200
	CHANNEL 3					
	Voltage Deviation Step 38 - Step 51 =	vdc				0.200
	CHANNEL 4					
52	Maximum (ON state) CHANNEL 5 voltage	vdc	27			29
	Minimum (OFF state) CHANNEL 5 voltage	vdc	0.00			5.0
53	Maximum (OFF state) CHANNEL 6 voltage	vrms	25.9			30.1
	Minimum (ON state) CHANNEL 6 voltage	vrms	0			5.0

\* TO BE USED AS REQUIRED OR DESIRED

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SUBSYSTEM				LEM G & N SYSTEM				ASSY							
DESCRIPTION								Provide Operate Control Test for IMU Time Delay, Gimbal Ambiguity, 1X Sin and Cos Signals, Standby to Operate Temperature Transient, 800 CPS P/S Thermistor, Temp. Mon., 1 Thermistor, PIPA Cal. Mod. Thermistor, Auto Cage, Inertial Temperature Control Point, Heater Telemetry Discrete, Blower Telemetry Discrete and Normalization.							
Rev.	Let.	Date	TORR NO.	PAGES REVISED		APPROVAL		REFERENCES PS-6015000							
A		6-7-68	29401	JDC	D.S.	MIT	NASA								
B		7-5-68	30045	All	All	MM	ACM								
C		8-10-66	30550	All	1,2,3	MM	WSA								
					All	EA	WSA				IMPORTANT				
											INTERVAL				
											TOOLS AND Wheatstone bridge MATERIAL 10 K ± 10% resistor				

- IMPORTANT: Insure that the G & N system has been in the STANDBY mode with LOC power ON for a minimum of 2 hours before proceeding with Step 12.
- INITIALIZATION
- Deleted.
  - Insure that the CGC/LGC POWER ON and the 400 CPS POWER ON pushbuttons are lit.
  - Insure that the STBY lamp on the DSKY is not lighted. If lighted, press the STBY pushbutton until the STBY lamp goes out.

VERIFICATION WITH SIDL REQUIRED BEFORE USE

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SUBSYSTEM		LEM G & N SYSTEM		ASSY	
11. Start the Oscillograph by setting the CHART DRIVE switch to MM/SEC.				17. When the DSKY registers display (approx):	
12. Simultaneously press the EVENT MARKER on the Oscillograph Control panel and the PROCEED/ISS OPERATE pushbutton on the Test Control panel.				Row 1 + 225 -- Row 2 + 225 -- Row 3 + 225 --	
13. Perform the following DSKY operations:				Press the PROCEED/ISS STANDBY pushbutton on the Test Control panel. The ISS STANDBY portion shall light and the PROCEED/ISS OPERATE pushbutton shall go out.	
a. VERB 11 NOUN 10 ENTR				18. Record the time that the ISS was placed in the STANDBY mode.	
b. 00012 ENTR				19. Set CHANNELS 3, 4, 5 and 6 of the Oscillograph Signal Selector panel to monitor the following signals:	
c. 0----- displayed				a. Accel Temperature on CHANNEL 3-3DC.	
14. Press the EVENT MARKER on the oscillograph control panel immediately after the DSKY display changes from 0-----to 4-----.				b. IRIG Temperature on CHANNEL 4-3DC.	
15. Stop the Oscillograph and record the elapsed time between EVENT MARKERS.				c. IMU Heater Discrete on CHANNEL 5	
16. Perform the following DSKY operations:				AUX	
a. Enter VERB 41 NOUN 20 ENTR				d. IMU Blower Discrete on CHANNEL 6	
b. Observe VERB 21 NOUN 22 Flashing				AUX	
c. Enter +22500 ENTR				20. Insure that the CHANNEL 3 DC, CHANNEL 4 DC, CHANNEL 5 DC and CHANNEL 6 AC pushbuttons on the Oscillograph Signal Selector panel are lighted.	
d. Observe VERB 22 NOUN 22 Flashing				21. Connect a jumper from TPA #2 TB4-21 (hi) and TPA #2 TB5-22 (lo) to TPA #2 DIRECT PROBES J9 (hi) and J10 (lo) respectively.	
e. Enter +22500				22. Connect a jumper from PROBES OUTPUT, DIRECT to CH 5, IN-DC on the Auxiliary Input Panel.	
f. Observe VERB 23 NOUN 22 Flashing				23. Connect jumpers from TPA #2 TB4-20 (hi) and TPA #2 TB5-33 (lo) to CH 6, IN-AC on the Auxiliary Input Panel.	
g. Enter +22500 ENTR					
h. Enter VERB 16 NOUN 20 ENTR					

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5051912-1

ASSY

24. Zero and calibrate CHANNELS 3, 4, and 5 on the Oscillograph Amplifier. Calibrate CHANNEL 6 after entering the OPERATE mode.

25. Mark the Oscillograph Channels as follows:

- a. CHANNEL 3 "start of PIPA TEMP stability test"
- b. CHANNEL 4 "start of IRIG TEMP stability test"
- c. CHANNEL 5 "start of IMU Heater Discrete"
- d. CHANNEL 6 "start of IMU Blower Discrete"

26. Set the CHART SPEEDS to 1 and RANGE to .2 V/CM on the Oscillograph Control for CHANNEL 3, 2 V/CM for CHANNEL 4 and 20 V/CM for CHANNELS 5 and 6.

NOTE: Read and understand steps 27 through 50 noting that steps 38, 39, and 40 shall be performed 15 minutes after step 32. Step 32 and 50 take precedence over steps 27 through 50.

#### GIMBAL AMBIGUITY TEST

27. Perform the following DSKY operations:

- a. VERB 11 NOUN 10 ENTR
- b. 00012 ENTR
- c. 00000 displayed

Allow the PIPA temperature to stabilize as indicated by a voltage change of 0.05 volt or less over a one hour period on CHANNEL 3. Record the average voltage indication for the stability period of CHANNELS 3 and 4.

28. Insure that at least 30 minutes have elapsed since the time recorded in step 18 and that the ISS has been in STANDBY during that period.

29. Start the Oscillograph by setting the CHART DRIVE switch to MM/SEC.

30. Press the PROCEED/ISS OPERATE pushbutton on the Test Control panel.

31. Press the EVENT MARKER on the Oscillograph Control Panel immediately after step 30 and record the time.

32. Verify and record by observing the PIPA Monitor Scope that no PIPA torquing is present until after the DSKY display changes from 00030 to 40000 to 00000.

33. Press the EVENT MARKER on the Oscillograph Control panel immediately after the DSKY display changes from 00030 to 40000 to 00000.

34. After the DSKY display changes from 00030 to 40000 to 00000 perform the following DSKY operation:

- a. VERB 16 NOUN 20 ENTR

35. Record the OG, MG, and IG positions as indicated on the Gimbal Position Control panel and as indicated on the DSKY displays. All axes shall indicate approximately 000.00°.

DATE 15 MAR 66

SUBSYSTEM LEM G & N SYSTEM		ASSY	
<u>1X SIN AND COS SIGNALS</u>			
36. Perform the following DSKY operations:			
a. VERB 41	NOUN 20	ENTR	
b. +00000	ENTR		
c. +00000	ENTR		
d. +00000	ENTR		
Set the PAVM FUNCTION selector to total and measure the following signals on the highest usable sensitivity of the meters.			
Record the Indications:			
Signal	<u>CROSSBAR CONTROL</u>		
a. Cos AOG 1X	241		
b. Cos AMG 1X	242		
c. Cos AIG 1X	243		
d. Sin AOG 1X	142		
e. Sin AMG 1X	143		
f. Sin AIG 1X	144		
37. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 173. Adjust the G & N VOLTAGE ADJUST until the DVM indicates 28.00 ( $\pm$ 0.25) VDC.			
<u>STANDBY TO OPERATE TEMPERATURE TRANSIENT</u>			
38. 15 minutes after performing step 31, press the EVENT MARKER on the Oscillograph Control panel and record the time and voltage indication of CHANNEL 3.			
39. 30 minutes after performing step 31 press the EVENT MARKER on the Oscillograph Control panel and record the time and voltage indicated on CHANNEL 4.			
<u>800 CPS P/S THERMISTOR</u>			
40. Insert a 10 K resistor in series with the Wheatstone bridge. Measure and record 800 cps P/S Temperature thermistor resistance across pins TB5-12 and TB5-13 on TPA #2.			
<u>TEMP MON 1 THERMISTOR</u>			
41. Measure and record the Temp Mon 1 thermistor resistance across pins TB5-14 and TB5-15 of TPA #2.			
<u>PIPA CAL. MOD. THERMISTOR</u>			
42. Measure and record PIPA Cal. Mod. thermistor resistance across TBI-31 and TBI-27 on TPA #2.			
<u>IMU CAGE</u>			
43. Perform the following DSKY operations:			
a. Enter	VERB 41	NOUN 20	ENTR
b. Observe	VERB 21	NOUN 21	Flashing
c. Enter	+00500	ENTR	
d. Observe	VERB 22	NOUN 22	Flashing
e. Enter	+00500	ENTR	
f. Observe	VERB 23	NOUN 22	Flashing
g. Enter	+00500	ENTR	
h. Enter	VERB 16	NOUN 20	ENTR
44. When the DSKY registers display (approx):			
Row 1 +00500			

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SUBSYSTEM LEM G & N SYSTEM	ASSY
Row 2 +00500 Row 3 +00500	temperature recorded in step 48. Calculate and record the difference.
press and hold the IMU CAGE COMMAND pushbutton on the Test Control panel. Perform the following DSKY operation:	50. Compare the PIPA temperature recorded in step 38 with the PIPA temperature recorded in step 48. Calculate and record the difference.
VERB 36 ENTR	51. Compare the IRIG temperature recorded in step 39 with the IRIG temperature recorded in step 48. Calculate and record the difference.
45. Set the PAVM FUNCTION selector to total and measure the following signals on the highest usable sensitivity of the meters. Record the indications:	HEATER TELEMETRY DISCRETE
Signal	CROSSBAR CONTROL
a. Sin AOG 1X 142	52. Record the maximum and minimum voltage indicated on CHANNEL 5.
b. Sin AMG 1X 143	BLOWER TELEMETRY DISCRETE
c. Sin AIG 1X 144	53. Record the minimum and/or maximum voltage indicated on CHANNEL 6 or both if the blower is cycling.
46. Release the IMU CAGE COMMAND pushbutton on the Test Control Panel and perform the following DSKY operations:	NORMALIZATION
VERB 11 NOUN 10 ENTR	54. Upon completion of the data sheets, make a copy of the data sheets and forward one set immediately to:
00012 ENTR	IMU Thermo Design Group
47. Record the display of Row 1.	MS 99
INERTIAL TEMPERATURE CONTROL POINT	Instrumentation Laboratory
48. Allow the PIPA and IRIG temperatures to stabilize as indicated by a voltage change of 0.05 volt or less over a one hour period. Stabilization should occur within 2 hours since performance of step 31. Record the average voltage indication for the stability period of CHANNELS 3 and 4. Stop the Oscillograph.	75 Cambridge Parkway
49. Compare the PIPA STANDBY voltage indication from step 27 with the PIPA	Cambridge, Massachusetts 02142

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SUBSYSTEM LEM G & N SYSTEM	ASSY
c. Enter +00000 ENTR	
d. Observe VERB 22 NOUN 22 Flashing	
e. Enter +00000	
f. Observe VERB 23 NOUN 22 Flashing	
g. Enter +00000	
h. Enter VERB 16 NOUN 20 ENTR	

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JDC 12616DC REV C INITIAL TDRR 27134						
JDC NO. 12616 REV C						
JOB OPERATE CONTROL TEST						
TEST HISTORY						
TITLE _____ DATE _____ START _____ END _____ SITE / LOCATION _____						
SER. NO. _____ DWG _____ REV _____ TIME _____ START _____ END _____ TOTAL ELAPSED _____						
MAJOR GROUND SUPPORT EQUIPMENT						
NAME _____ SER. NO. _____ CAL DATE _____						
NAME _____ SER. NO. _____ CAL DATE _____						
CONDUCTED BY _____ NAME/AFFILIATION _____ APPROVED BY _____ NAME/AFFILIATION _____						
JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES	MAX VALUE	REJ ACC
6	DVM voltage	volts	27.75	1st 2nd* 3rd*		
15	Elapsed time	sec	85		28.25	
18	Time	hr min			95	
27	CHANNEL 3 Voltage	VDC				
28	CHANNEL 4 Voltage	VDC				
28	Elapsed time	min	30			
31	Time	hr min				
32	PIPA torquing not present until after Display change					
35	OG Gimbal position					
	MG Gimbal position					
	IG Gimbal position					
	OG DSKY position					

\* TO BE USED AS REQUIRED OR DESIRED DATE 15 MAR 66

JDC 12616DC REV C INITIAL TDRR 27134						
JDC NO. 12616 REV C						
JOB OPERATE CONTROL TEST						
JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES	MAX VALUE	REJ ACC
35	MG DSKY position			1st 2nd* 3rd*		
36	IG DSKY position					
	Cos AOG 1X	vrms	23.4		28.6	
	Cos AMG 1X	vrms	23.4		28.6	
	Cos AIG 1X	vrms	23.4		28.6	
	Sin AOG 1X	vrms	0.00		0.50	
	Sin AMG 1X	vrms	0.00		0.50	
	Sin AIG 1X	vrms	0.00		0.50	
38	Time	min				
	CHANNEL 3 Voltage	VDC				
39	Time	min				
	CHANNEL 4 Voltage	VDC				
40	800 CPS/PS temperature	ohms	12210		18,370	
41	Temp Mon 1	ohms	11400		23,250	
42	PIPA Cal. Mod.	ohms	13650		23,250	
45	Sin AOG 1X	vrms	0.00		0.50	
	Sin AMG 1X	vrms	0.00		0.50	
	Sin AIG 1X	vrms	0.00		0.50	
47	Row 1 display		xxxxx		xxxxx	
48	CHANNEL 3 Voltage	VDC	-0.5		+0.5	
	CHANNEL 4 Voltage	VDC	-0.75		+0.75	
49	Step 27 - Step 48	VDC			0.25	

\* TO BE USED AS REQUIRED OR DESIRED DATE 15 MAR 66

APOLLO G & N  
EQUIPMENT TEST  
DATA SHEET 3 OF 3

JDC  
NO. 12613  
REV. C

JOB OPERATE CONTROL TEST

JDC ITEM NO	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES			MAX VALUE	REJ	ACC
				1st	2nd*	3rd*			
50	Step 38 - Step 48	VDC					0.25		
51	Step 39 - Step 48	VDC					0.25		
52	Maximum (ON state) CHANNEL 5 Voltage	VDC	27				29		
	Minimum (OFF state) CHANNEL 5 Voltage	VDC	0.00				5.0		
53	Maximum (OFF state) CHANNEL 6 Voltage	vrms	25.9				30.1		
	Minimum (ON state) CHANNEL 6 Voltage	vrms	0				5.0		

\* TO BE USED AS REQUIRED OR DESIRED

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SUBSYSTEM	LEM G & N SYSTEM	ASSY
Row 2 +00500		temperature recorded in step 48. Calculate and record the difference.
Row 3 +00500		50. Compare the PIPA temperature recorded in step 38 with the PIPA temperature recorded in step 48. Calculate and record the difference.
VERB 36	ENTR	51. Compare the IRIG temperature recorded in step 39 with the IRIG temperature recorded in step 48. Calculate and record the difference.
45. Set the PAYM FUNCTION selector to total and measure the following signals on the highest usable sensitivity of the meters.		HEATER TELEMETRY DISCRETE
Record the indications:		52. Record the maximum and minimum voltage indicated on CHANNEL 5.
Signal	CROSSBAR CONTROL	BLOWER TELEMETRY DISCRETE
a. Sin AOG 1X	142	53. Record the minimum and/or maximum voltage indicated on CHANNEL 6 or both if the blower is cycling.
b. Sin AMG 1X	143	NORMALIZATION
c. Sin AIG 1X	144	54. Upon completion of the data sheets, make a copy of the data sheets and forward one set immediately to:
46. Release the IMU CAGE COMMAND pushbutton on the Test Control Panel and perform the following DSKY operations:		IMU Thermo Design Group
VERB 11	NOUN 10	MS 99
00012	ENTR	Instrumentation Laboratory
47. Record the display of Row 1.		75 Cambridge Parkway
INERTIAL TEMPERATURE CONTROL		Cambridge, Massachusetts 02142
POINT		55. Perform the following DSKY operations:
48. Allow the PIPA and IRIG temperatures to stabilize as indicated by a voltage change of 0.05 volt or less over a one hour period. Stabilization should occur within 2 hours since performance of step 31. Record the average voltage indication for the stability period of CHANNELS 3 and 4. Stop the Oscilloscope.		a. Enter
49. Compare the PIPA STANDBY voltage indication from step 27 with the PIPA		VERB 41

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APOLLO G & N  
EQUIPMENT TEST  
DATA SHEET 1 OF 3

JOB OPERATE CONTROL TEST

ASSEMBLY UNDER TEST		TEST HISTORY	
TITLE	DATE	START	END
SER. NO.	DWG	REV.	SITE / LOCATION
MAJOR GROUND SUPPORT EQUIPMENT			
CONDUCTED BY: NAME/AFFILIATION			
APPROVED BY: NAME/AFFILIATION			
JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE
RECORDED VALUES			
1st 2nd* 3rd*			
6	DVM voltage	volts	27.75
15	Elapsed time	sec	85
18	Time	hr	
27	CHANNEL 3 Voltage	VDC	
28	CHANNEL 4 Voltage	VDC	
31	Elapsed time	min	30
32	PIPA torquing not present until after Display change	min	
35	OG Gimbal position		
	MG Gimbal position		
	IG Gimbal position		
	OG DSKY position		

\* TO BE USED AS REQUIRED OR DESIRED

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FORM 00019  
Chg. 1-2-66

SUBSYSTEM	LEM G & N SYSTEM	ASSY
c. Enter	+00000	ENTR
d. Observe		
VERB 22	NOUN 22	Flashing
e. Enter	+00000	
f. Observe		
VERB 23	NOUN 22	Flashing
g. Enter	+00000	
h. Enter		
VERB 16	NOUN 20	ENTR

APOLLO G & N  
EQUIPMENT TEST  
DATA SHEET 2 OF 3

JOB OPERATE CONTROL TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES	MAX VALUE	REJ ACC
				1st 2nd* 3rd*		
35	MG DSKY position (cont)					
36	Cos AOG 1X	vrms	23.4		28.6	
	Cos AMG 1X	vrms	23.4		28.6	
	Cos AIG 1X	vrms	23.4		28.6	
	Sin AOG 1X	vrms	0.00		0.50	
	Sin AMG 1X	vrms	0.00		0.50	
	Sin AIG 1X	vrms	0.00		0.50	
38	Time	min				
	CHANNEL 3 Voltage	VDC				
39	Time	min				
	CHANNEL 4 Voltage	VDC				
40	800 CPS/PS temperature	ohms	12210		16,370	
41	Temp Mon 1	ohms	11400		23,250	
42	PIPA Cal. Mod.	ohms	13650		23,250	
45	Sin AOG 1X	vrms	0.00		0.50	
	Sin AMG 1X	vrms	0.00		0.50	
	Sin AIG 1X	vrms	0.00		0.50	
47	Row 1 display		xxxxx		xxxxx	
48	CHANNEL 3 Voltage	VDC	-0.5		+0.5	
	CHANNEL 4 Voltage	VDC	-0.75		+0.75	
49	Step 27 - Step 48	VDC			0.25	

\* TO BE USED AS REQUIRED OR DESIRED

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FORM 00019  
Chg. 1-2-66



SUBSYSTEM LEM G & N SYSTEM				ASSY.			
DESCRIPTION		Provide Operate Control Test for IMU Time Delay, Gimbal Ambiguity, 1X Sin and Cos Signals, Standby to Operate Temperature Transient, 800 CPS P/S Thermistor, Temp. Mon. 1 Thermistor, PIPA Cal. Mod. Thermistor, Auto Cage, Inertial Temperature Control Point, Heater Telemetry Discrete, Blower Telemetry Discrete and Normalization.					
Rev.	Date	TDRR NO.	PAGES REVISED		APPROVAL		REFERENCES PS-6015000
Let.			JDC	D. S.	MIT	NASA	
A	6-7-66	28401	ALL	ALL	MM	JACM	
B	7-5-66	30045	1,2,3	-	MM	WS	
C	8-10-66	30530	ALL	ALL	EA	WS	
D	10-13-66	31512	1,2	-	EA	-	
E	11-10-66	31902	3,4,5	-	EA	-	
							INTERVAL
							TOOLS AND Wheatstone bridge MATERIAL 10 K ± 10% resistor

- IMPORTANT:** Insure that the G & N system has been in the STANDBY mode with LGC power ON for a minimum of 2 hours before proceeding with Step 12.
- INITIALIZATION**
- Deleted.
  - Insure that the CGC/LGC POWER ON and the 400 CPS POWER ON pushbuttons are lit.
  - Insure that the STBY lamp on the DSKY is not lighted. If lighted, press the STBY pushbutton until the STBY lamp goes out.

VERIFICATION WITH SIDL REQUIRED BEFORE USE  
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- JOB OPERATE CONTROL TEST JDC 12616 REV. E PAGE 2 OF 6
- SUBSYSTEM LEM G & N SYSTEM**
- Set switches and controls on the Counter as follows:  
DISPLAY RESET to ZERO  
CLOCK FREQUENCY DIVIDER to  $10^4$   
CLOCK SELECTOR to INT  
INPUT SELECTOR to C SENSE  
SENSE SELECTOR to FWD  
FUNCTION to COUNT
  - Simultaneously press the RESET pushbutton on the Counter and the PROCEED/ISS OPERATE pushbutton on the Test Control panel.
  - Perform the following DSKY operations:  
a. VERB 11 NOUN 10 ENTR  
b. 00012 ENTR  
c. 0----- displayed  
14. Set the FUNCTION selector on the Counter to OFF immediately after the DSKY display changes from 0----- to 4-----.
  - Record the time displayed on the Counter.
  - Perform the following DSKY operations:  
a. Enter VERB 41 NOUN 20 ENTR  
b. Observe VERB 21 NOUN 22 Flashing  
c. Enter +22500 ENTR  
d. Observe VERB 22 NOUN 22 Flashing  
e. Enter +22500  
f. Observe VERB 23 NOUN 22 Flashing  
g. Enter +22500 ENTR  
h. Enter VERB 16 NOUN 20 ENTR
  - When the DSKY registers display (approx):  
Row 1 + 225 --  
Row 2 + 225 --  
Row 3 + 225 --  
Press the PROCEED/ISS STANDBY pushbutton on the Test Control panel. The ISS STANDBY portion shall light and the PROCEED/ISS OPERATE pushbutton shall go out.
  - Record the time that the ISS was placed in the STANDBY mode.
  - Set CHANNELS 3, 4, 5 and 6 of the Oscillograph Signal Selector panel to monitor the following signals:  
a. Accel Temperature on CHANNEL 3-3DC.  
b. IRIG Temperature on CHANNEL 4-3DC.  
c. IMU Heater Discrete on CHANNEL 5 AUX  
d. IMU Blower Discrete on CHANNEL 6 AUX
  - Insure that the CHANNEL 3 DC, CHANNEL 4 DC, CHANNEL 5 DC and CHANNEL 6 AC pushbuttons on the Oscillograph Signal Selector panel are lighted.
  - Connect a jumper from TPA #2 TB4-21 (hi) and TPA #2 TB5-22 (lo) to TPA #2 DIRECT PROBES J9 (hi) and J10 (lo) respectively.
  - Connect a jumper from PROBES OUTPUT, DIRECT to CH 5, IN-DC on the Auxiliary Input Panel.
  - Connect jumpers from TPA #2 TB4-20 (hi) and TPA #2 TB5-33 (lo) to CH 6, IN-AC on the Auxiliary Input Panel.
- DATE 15 MAR 66

- JOB OPERATE CONTROL TEST JDC 12616 REV. E PAGE 3 OF 6
- SUBSYSTEM LEM G & N SYSTEM**
- Zero and calibrate CHANNELS 3, 4, and 5 on the Oscillograph Amplifier. Calibrate CHANNEL 6 after entering the OPERATE mode.
  - Mark the Oscillograph Channels as follows:  
a. CHANNEL 3 "start of PIPA TEMP stability test"  
b. CHANNEL 4 "start of IRIG TEMP stability test"  
c. CHANNEL 5 "start of IMU Heater Discrete"  
d. CHANNEL 6 "start of IMU Blower Discrete"
  - Set the CHART SPEEDS to 1 and RANGE to .2 V/CM on the Oscillograph Control for CHANNEL 3, 2 V/CM for CHANNEL 4 and 20 V/CM for CHANNELS 5 and 6. Start the Oscillograph by setting the CHART DRIVE switch to MM/SEC.
  - Read and understand steps 27 through 50 noting that steps 38, 39, and 40 shall be performed 15 minutes after step 32. Steps 32 and 50 take precedence over steps 27 through 50.
- GIMBAL AMBIGUITY TEST**
- Perform the following DSKY operations:  
a. VERB 11 NOUN 10 ENTR  
b. 00012 ENTR

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- JOB OPERATE CONTROL TEST JDC 12616 REV. E PAGE 4 OF 6
- SUBSYSTEM LEM G & N SYSTEM**
- Perform the following DSKY operations:  
a. VERB 41 NOUN 20 ENTR  
b. +00000 ENTR  
c. +00000 ENTR  
d. +00000 ENTR
  - Set the PAVM FUNCTION selector to total and measure the following signals on the highest usable sensitivity of the meters. Record the indications:  
Signal  
a. Cos AOG IX 241  
b. Cos AMG IX 242  
c. Cos AIG IX 243  
d. Sin AOG IX 142  
e. Sin AMG IX 143  
f. Sin AIG IX 144
  - Set the CROSSEBAR CONTROL on the Primary Signal Selector panel to 173. Adjust the G & N VOLTAGE ADJUST until the DVM indicates 28.00 ( $\pm 0.25$ ) VDC.
  - STANDBY TO OPERATE TEMPERATURE TRANSIENT  
38. 15 minutes after performing step 31, press the EVENT MARKER on the Oscillograph Control panel and record the time and voltage indication of CHANNEL 3.
  - 30 minutes after performing step 31 press the EVENT MARKER ON the Oscillograph Control panel and record the time and voltage indicated on CHANNEL 4. Change the CHANNEL 4 Range to the smallest usable scale.
  - 800 CPS P/S THERMISTOR  
40. Insert a 10 K resistor in series with the Wheatstone bridge. Measure and record 800 cps P/S Temperature thermistor resistance across pins TB5-12 and TB5-13 on TPA #2.
  - TEMP MON 1 THERMISTOR  
41. Measure and record the Temp Mon 1 thermistor resistance across pins TB5-14 and TB5-15 of TPA #2.
  - PIPA CAL. MOD. THERMISTOR  
42. Measure and record PIPA Cal. Mod. thermistor resistance across TBI-31 and TBI-27 on TPA #2.
  - IMU CAGE  
43. Perform the following DSKY operations:  
a. Enter VERB 41 NOUN 20 ENTR  
b. Observe VERB 21 NOUN 22 Flashing  
c. Enter +00500 ENTR  
d. Observe VERB 22 NOUN 22 Flashing  
e. Enter +00500 ENTR  
f. Observe VERB 23 NOUN 22 Flashing  
g. Enter +00500 ENTR  
h. Enter VERB 16 NOUN 20 ENTR
  - When the DSKY registers display (approx):  
Row 1 +00500

Row 2 +00500

Row 3 +00500

press and hold the IMU CAGE COMMAND pushbutton on the Test Control panel. Perform the following DSKY operation:

VERB 36 ENTR

NOTE: Disregard ISS WARNING light on Monitor Panel. The ISS WARNING light will extinguish in step 46.

45. Set the PAVM FUNCTION selector to total and measure the following signals on the highest usable sensitivity of the meters. Record the indications:

SIGNAL CROSSBAR CONTROL

a. Sin AOG 1X 142

b. Sin AMG 1X 143

c. Sin AIG 1X 144

46. Release the IMU CAGE COMMAND pushbutton on the Test Control Panel and perform the following DSKY operations:

VERB 11 NOUN 10 ENTR

00012 ENTR

47. Record the display of Row 1. INERTIAL TEMPERATURE CONTROL POINT

48. Allow the PIPA and IRIG temperatures to stabilize as indicated by a voltage change of 0.05 volt or less over a one hour period. Stabilization should occur within 2 hours since performance of step 31. Record the average voltage indication for the stability period of CHANNELS 3 and 4. Stop the Oscillograph.

55. Perform the following DSKY operations:

a. Enter VERB 41 NOUN 20 ENTR

b. Observe VERB 21 NOUN 22 Flashing

IMU Thermo Design Group MS 99

Instrumentation Laboratory 75 Cambridge Parkway

Cambridge, Massachusetts 02142

55. Perform the following DSKY operations:

a. Enter VERB 41 NOUN 20 ENTR

b. Observe VERB 21 NOUN 22 Flashing

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c. Enter +00000 ENTR

d. Observe VERB 22 NOUN 22 Flashing

e. Enter +00000

f. Observe VERB 23 NOUN 22 Flashing

g. Enter +00000

h. Enter VERB 16 NOUN 20 ENTR

ASSEMBLY UNDER TEST TEST HISTORY

TITLE DATE START END SITE / LOCATION

SER. NO. DWG REV. TIME START END TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT

NAME SER. NO. CAL DATE

NAME SER. NO. CAL DATE

CONDUCTED BY NAME/AFFILIATION APPROVED BY NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES	MAX VALUE	REJ ACC
				1st 2nd* 3rd*		
6	DVM voltage	vols	27.75		28.25	
15	Elapsed time	sec	85		95	
18	Time	hr min				
27	CHANNEL 3 Voltage	VDC				
	CHANNEL 4 Voltage	VDC				
28	Elapsed time	min	30			
31	Time	hr min				
32	PIPA torquing not present until after Display change					
35	OG Gimbal position					
	MG Gimbal position					
	IG Gimbal position					
	OG DSKY position					

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES	MAX VALUE	REJ ACC
				1st 2nd* 3rd*		
35	MG DSKY position					
(cont)	IG DSKY position					
36	Cos AOG 1X	vrms	23.4		28.6	
	Cos AMG 1X	vrms	23.4		28.6	
	Cos AIG 1X	vrms	23.4		28.6	
	Sin AOG 1X	vrms	0.00		0.50	
	Sin AMG 1X	vrms	0.00		0.50	
	Sin AIG 1X	vrms	0.00		0.50	
38	Time	min				
	CHANNEL 3 Voltage	VDC				
39	Time	min				
	CHANNEL 4 Voltage	VDC				
40	800 CPS/PS temperature	ohms	12210		18,370	
41	Temp Mon 1	ohms	11400		23,250	
42	PIPA Cal. Mod.	ohms	13650		23,250	
45	Sin AOG 1X	vrms	0.00		0.50	
	Sin AMG 1X	vrms	0.00		0.50	
	Sin AIG 1X	vrms	0.00		0.50	
47	Row 1 display	xxxxx			xxxxx	
48	CHANNEL 3 Voltage	VDC	-0.5		-0.5	
	CHANNEL 4 Voltage	VDC	-0.75		-0.75	
49	Step 27 - Step 48	VDC			0.25	





SUBSYSTEM LEM G & N SYSTEM			
DESCRIPTION Provide Control Test for IMU Time Delay, Gimbal Ambiguity, 1X Sin and Cos Signals, Standby to Operate Temperature Transient, 800 CPS P/S Thermistor, Temp. Mon. 1 Thermistor, PIPA Cal. Mod. Thermistor, Auto Cage, Inertial Temperature Control Point, Heater Telemetry Discrete, Blower Telemetry Discrete and Normalization.			
Rev. Let.	Date	TDRR NO.	PAGES REVISED
A	6-7-66	29401	ALL
B	7-5-66	30045	1.2.3
C	8-10-66	30550	ALL
D	10-13-66	31512	1.2
E	11-10-66	31902	3.4.5
F	1-18-67	32667	6
APPROVAL			
REFERENCES PS-6015000			
IMPORTANT			
INTERVAL			
TOOLS AND Wheatstone bridge, MATERIAL 10 K $\pm$ 10% resistor			

IMPORTANT: Insure that the G & N system has been in the STANDBY mode with LGC power ON for a minimum of 2 hours before proceeding with Step 12.

#### INITIALIZATION

- Deleted.
- Insure that the CGC/LGC POWER ON and the 400 CPS POWER ON pushbuttons are lit.
- Insure that the STBY lamp on the DSKY is not lighted. If lighted, press the STBY pushbutton until the STBY lamp goes out.

VERIFICATION WITH SIDL REQUIRED BEFORE USE  
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FORM 0014  
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SUBSYSTEM LEM G & N SYSTEM	
ASSY	
11. Set switches and controls on the Counter as follows: DISPLAY RESET to ZERO CLOCK FREQUENCY DIVIDER to 10 <sup>4</sup> CLOCK SELECTOR to INT INPUT SELECTOR to C SENSE SENSE SELECTOR to FWD FUNCTION to COUNT	17. When the DSKY registers display (approx): Row 1 +225 Row 2 +225 Row 3 +225
12. Simultaneously press the RESET pushbutton on the Counter and the PROCEED/ISS OPERATE pushbutton on the Test Control panel.	Press the PROCEED/ISS STANDBY pushbutton on the Test Control panel. The ISS STANDBY portion shall light and the PROCEED/ISS OPERATE pushbutton shall go out.
13. Perform the following DSKY operations: a. VERB 11 NOUN 10 ENTR b. 00012 c. 0----	18. Record the time that the ISS was placed in the STANDBY mode. 19. Set CHANNELS 3, 4, 5 and 6 of the Oscillograph Signal Selector panel to monitor the following signals: a. Accel Temperature on CHANNEL 3-3DC. b. IRIG Temperature on CHANNEL 4-3DC. c. IMU Heater Discrete on CHANNEL 5 AUX d. IMU Blower Discrete on CHANNEL 6 AUX
14. Set the FUNCTION selector on the Counter to OFF immediately after the DSKY display changes from 0---- to 4----.	20. Insure that the CHANNEL 3 DC, CHANNEL 4 DC, CHANNEL 5 DC and CHANNEL 6 AC pushbuttons on the Oscillograph Signal Selector panel are lighted.
15. Record the time displayed on the Counter.	21. Connect a jumper from TPA #2 TB4-21 (ht) and TPA #2 TB5-22 (lo) to TPA #2 DIRECT PROBES J9 (ht) and J10 (lo) respectively.
16. Perform the following DSKY operations: a. Enter b. Observe c. Enter d. Observe e. Enter f. Observe g. Enter h. Enter	22. Connect a jumper from PROBES OUTPUT, DIRECT to CH 5, IN-DC on the Auxiliary Input Panel. 23. Connect jumpers from TPA #2 TB4-20 (ht) and TPA #2 TB5-33 (lo) to CH 6, IN-AC on the Auxiliary Input Panel.
17. VERB 41 NOUN 20 ENTR 18. VERB 21 NOUN 22 Flashing 19. Enter +22500 ENTR 20. VERB 22 NOUN 22 Flashing 21. Enter +22500 22. VERB 23 NOUN 22 Flashing 23. Enter +22500 ENTR 24. VERB 16 NOUN 20 ENTR	

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SUBSYSTEM LEM G & N SYSTEM	
ASSY	
24. Zero and calibrate CHANNELS 3, 4, and 5 on the Oscillograph Amplifier. Calibrate CHANNEL 6 after entering the OPERATE mode.	25. Mark the Oscillograph Channels as follows: a. CHANNEL 3 "start of PIPA TEMP stability test" b. CHANNEL 4 "start of IRIG TEMP stability test" c. CHANNEL 5 "start of IMU Heater Discrete" d. CHANNEL 6 "start of IMU Blower Discrete"
26. Set the CHART SPEEDS to 1 and RANGE to .2 V/CM on the Oscillograph Control for CHANNEL 3, 2 V/CM for CHANNEL 4 and 20 V/CM for CHANNELS 5 and 6. Start the Oscillograph by setting the CHART DRIVE switch to MM/SEC.	27. Perform the following DSKY operations: a. VERB 11 NOUN 10 ENTR b. 00012
28. Allow the PIPA temperature to stabilize as indicated by a voltage change of 0.05 volt or less over a one hour period on CHANNEL 3. Record the average voltage indication for the stability period of CHANNELS 3 and 4.	29. Deleted.
29. Deleted.	30. Press the PROCEED/ISS OPERATE pushbutton on the Test Control panel.
31. Press the EVENT MARKER on the Oscillograph Control Panel immediately after step 30 and record the time.	32. Verify and record by observing the PIPA Monitor Scope that no PIPA torquing is present until after the DSKY display changes from 00030 to 40000 to 00000.
33. Press the EVENT MARKER on the Oscillograph Control panel immediately after the DSKY display changes from 00030 to 40000 to 00000.	34. After the DSKY display changes from 00030 to 40000 to 00000 perform the following DSKY operation: a. VERB 16 NOUN 20 ENTR
35. Record the OG, MG, and IG positions as indicated on the Gimbal Position Control panel and as indicated on the DSKY display. All axes shall indicate approximately 000.10°.	
GIMBAL AMBIGUITY TEST	
27. Perform the following DSKY operations: a. VERB 11 NOUN 10 ENTR b. 00012	

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SUBSYSTEM LEM G & N SYSTEM	
ASSY	
36. Perform the following DSKY operations: a. VERB 41 NOUN 20 ENTR b. +00000 ENTR c. +00000 ENTR d. +00000 ENTR	37. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 173. Adjust the G & N VOLTAGE ADJUST until the DVM indicates 28.00 ( $\pm$ 0.25) VDC.
Set the PAYM FUNCTION selector to total and measure the following signals on the highest usable sensitivity of the meters.	Record the Indications: Signal a. Cos AOG 1X b. Cos AMG 1X c. Cos AG 1X d. Sin AOG 1X e. Sin AMG 1X f. Sin AG 1X
38. 15 minutes after performing step 31, press the EVENT MARKER on the Oscillograph Control panel and record the time and voltage indication of CHANNEL 3.	39. 30 minutes after performing step 31, press the EVENT MARKER on the Oscillograph Control panel and record the time and voltage indicated on CHANNEL 4. Change the CHANNEL 4 Range to the smallest usable scale.
TRANSIENT	
38. 15 minutes after performing step 31, press the EVENT MARKER on the Oscillograph Control panel and record the time and voltage indication of CHANNEL 3.	
39. 30 minutes after performing step 31, press the EVENT MARKER on the Oscillograph Control panel and record the time and voltage indicated on CHANNEL 4. Change the CHANNEL 4 Range to the smallest usable scale.	
40. Insert a 10 K resistor in series with the Wheatstone bridge. Measure and record 800 cps P/S Temperature thermistor resistance across pins TB5-12 and TB5-13 on TPA #2.	
TEMP MON 1 THERMISTOR	
41. Measure and record the Temp Mon 1 thermistor resistance across pins TB5-14 and TB5-15 of TPA #2.	
PIPA CAL. MOD. THERMISTOR	
42. Measure and record PIPA Cal. Mod. thermistor resistance across TBI-31 and TBI-27 on TPA #2.	
IMU CAGE	
43. Perform the following DSKY operations: a. Enter b. Observe c. Enter d. Observe e. Enter f. Observe g. Enter h. Enter	
44. When the DSKY registers display (approx): Row 1 +00500	

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SUBSYSTEM LEM G &amp; N SYSTEM

ASSY

Row 2 +00500

Row 3 +00500

press and hold the IMU CAGE COMMAND pushbutton on the Test Control panel. Perform the following DSKY operation:

VERB 36 ENTR

NOTE: Disregard ISS WARN-

ING light on Monitor Panel.

The ISS WARNING light will

extinguish in step 46.

45. Set the PAVM FUNCTION selector to total and measure the following signals on the highest usable sensitivity of the meters. Record the indications:

Signal

CROSSBAR

CONTROL

a. Sin AOG 1X

b. Sin AMG 1X

c. Sin AIG 1X

46. Release the IMU CAGE COMMAND

pushbutton on the Test Control Panel and

perform the following DSKY operations:

VERB 11 NOUN 10 ENTR

00012 ENTR

47. Record the display of Row 1.

INERTIAL TEMPERATURE CONTROL

POINT

48. Allow the PIPA and IRIG temperatures to stabilize as indicated by a voltage change of 0.05 volt or less over a one hour period. Stabilization should occur within 2 hours since performance of step 31. Record the average voltage indication for the stability period of CHANNELS 3 and 4. Stop the Oscillograph.

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FORM 00144

Chg. 7-23-55

APOLLO 6 & N  
EQUIPMENT TEST

DATA SHEET 1 OF 3

JOB OPERATE CONTROL TEST

JDC  
NO. 12616  
REV. F  
INITIAL TDRR 27134

ASSEMBLY UNDER TEST		TEST HISTORY				
TITLE	DATE	START	END	SITE / LOCATION		
SER. NO.	DWG	REV.	TIME	START	END	
MAJOR GROUND SUPPORT EQUIPMENT						
CONDUCTED BY NAME/AFFILIATION						
APPROVED BY NAME/AFFILIATION						
JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES	MAX VALUE	
				1st	2nd*	3rd*
6	DVM voltage	volts	27.50			28.50
15	Elapsed time	sec	85			95
18	Time	hr				
		min				
27	CHANNEL 3 Voltage	VDC				
	CHANNEL 4 Voltage	VDC				
31	Time	hr				
		min				
32	PIPA torquing not present until after Display change					
35	OG Gimbal position					
	MG Gimbal position					
	IG Gimbal position					
	OG DSKY position					

\* TO BE USED AS REQUIRED OR DESIRED

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FORM 0-14c  
Chg. 7-23-55

SUBSYSTEM LEM G &amp; N SYSTEM

ASSY

c. Enter +00000 ENTR

d. Observe VERB 22 NOUN 22 Flashing

e. Enter +00000 ENTR

f. Observe VERB 23 NOUN 22 Flashing

g. Enter +00000 ENTR

h. Enter VERB 16 NOUN 20 ENTR

DATE 15 MAR 68

FORM 00144  
Chg. 7-23-55APOLLO 6 & N  
EQUIPMENT TEST

DATA SHEET 2 OF 3

JOB OPERATE CONTROL TEST

JDC  
NO. 12616  
REV. F

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES	MAX VALUE	REJ ACC
				1st	2nd*	3rd*
35	MG DSKY position					
(cont)	IG DSKY position					
36	Cos AOG 1X	vrms	23.4			28.6
	Cos AMG 1X	vrms	23.4			28.6
	Cos AIG 1X	vrms	23.4			28.6
	Sin AOG 1X	vrms	0.00			0.50
	Sin AMG 1X	vrms	0.00			0.50
	Sin AIG 1X	vrms	0.00			0.50
38	Time	min				
	CHANNEL 3 Voltage	VDC				
39	Time	min				
	CHANNEL 4 Voltage	VDC				
40	800 CPS/PS temperature	ohms	12210			18,370
41	Temp Mon 1	ohms	11400			23,250
42	PIPA Cal. Mod.	ohms	13650			23,250
45	Sin AOG 1X	vrms	0.00			0.50
	Sin AMG 1X	vrms	0.00			0.50
	Sin AIG 1X	vrms	0.00			0.50
47	Row 1 display		xxxxxx			xxxxxx
48	CHANNEL 3 Voltage	VDC	-0.5			+0.5
	CHANNEL 4 Voltage	VDC	-0.75			+0.75
49	Step 27 - Step 48	VDC				0.50

\* TO BE USED AS REQUIRED OR DESIRED

DATE 15 MAR 68

FORM 00144  
Chg. 7-23-55



SUBSYSTEM LEM G &amp; N SYSTEM ASSY

Row 2 +00500  
Row 3 +00500  
press and hold the IMU CAGE COMMAND pushbutton on the Test Control panel. Perform the following DSKY operation:  
VERB 36 ENTR

NOTE: Disregard ISS WARNING light on Monitor Panel. The ISS WARNING light will extinguish in step 46.

45. Set the PAVM FUNCTION selector to total and measure the following signals on the highest usable sensitivity of the meters. Record the indications:

Signal CROSSBAR CONTROL

a. Sin AOG 1X 142  
b. Sin AMG 1X 143  
c. Sin AIG 1X 144

46. Release the IMU CAGE COMMAND pushbutton on the Test Control Panel and perform the following DSKY operations:

VERB 11 NOUN 10 ENTR  
00012 ENTR

47. Record the display of Row 1.

INERTIAL TEMPERATURE CONTROL POINT

48. Allow the PIPA and IRIG temperatures to stabilize as indicated by a voltage change of 0.05 volt or less over a one hour period. Stabilization should occur within 2 hours since performance of step 31. Record the average voltage indication for the stability period of CHANNELS 3 and 4. Stop the Oscillograph.

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FORM 00144  
Chg. 7-23-65

SUBSYSTEM LEM G &amp; N SYSTEM ASSY

c. Enter +00000 ENTR  
d. Observe VERB 22 NOUN 22 Flashing  
e. Enter +00000 ENTR  
f. Observe VERB 23 NOUN 22 Flashing  
g. Enter +00000 ENTR  
h. Enter VERB 16 NOUN 20 ENTR

DATE 15 MAR 66  
FORM 00144  
Chg. 7-23-65APOLLO G & N  
EQUIPMENT TEST  
DATA SHEET 1 OF 3

JOB OPERATE CONTROL TEST

JDC  
NO. 12616  
REV. F  
INITIAL TDRR 27104

ASSEMBLY UNDER TEST		TEST HISTORY					
TITLE		DATE		END		SITE / LOCATION	
SER. NO.		DWG		REV.		TOTAL ELAPSED	
NAME		MAJOR GROUND SUPPORT EQUIPMENT		SER. NO.		CAL DATE	
NAME		MAJOR GROUND SUPPORT EQUIPMENT		SER. NO.		CAL DATE	
CONDUCTED BY		NAME/AFFILIATION		APPROVED BY		NAME/AFFILIATION	
JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES	MAX VALUE	REJ ACC	
				1st	2nd*	3rd*	
6	DYM voltage	volts	27.60			28.50	
15	Elapsed time	sec	85			95	
18	Time	hr					
		min					
27	CHANNEL 3 Voltage	VDC					
	CHANNEL 4 Voltage	VDC					
31	Time	hr					
		min					
32	PIPA torquing not present until after Display change						
35	OG Gimbal position						
	MG Gimbal position						
	IG Gimbal position						
	OG DSKY position						

\* TO BE USED AS REQUIRED OR DESIRED

DATE 15 MAR 66

FORM 00149  
Chg. 7-23-65APOLLO G & N  
EQUIPMENT TEST  
DATA SHEET 2 OF 3

JOB OPERATE CONTROL TEST

JDC  
NO. 12616  
REV. F

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES	MAX VALUE	REJ ACC
				1st	2nd*	3rd*
35	MG DSKY position					
(cont)	IG DSKY position					
36	Cos AOG 1X	vrms	23.4			28.6
	Cos AMG 1X	vrms	23.4			28.6
	Cos AIG 1X	vrms	23.4			28.6
	Sin AOG 1X	vrms	0.00			0.50
	Sin AMG 1X	vrms	0.00			0.50
	Sin AIG 1X	vrms	0.00			0.50
38	Time	min				
	CHANNEL 3 Voltage	VDC				
39	Time	min				
	CHANNEL 4 Voltage	VDC				
40	800 CPS/P8 temperature	ohms	12210			18,370
41	Temp Mon 1	ohms	11400			23,250
42	PIPA Cal. Mod.	ohms	13650			23,250
45	Sin AOG 1X	vrms	0.00			0.50
	Sin AMG 1X	vrms	0.00			0.50
	Sin AIG 1X	vrms	0.00			0.50
47	Row 1 display	xxxxx	xxxxx			xxxxx
48	CHANNEL 3 Voltage	VDC	-0.5			+0.5
	CHANNEL 4 Voltage	VDC	-0.75			+0.75
49	Step 27   -   Step 48	VDC				0.50

\* TO BE USED AS REQUIRED OR DESIRED

DATE 15 MAR 66  
FORM 00149  
Chg. 7-23-65



APOLLO 6 & N  
EQUIPMENT TEST  
DATA SHEET 3 OF 3

JDC
NO. 12616
REV. F

JOB OPERATE CONTROL TEST

JDC ITEM NO	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES			MAX VALUE	REJ ACC
				1st	2nd*	3rd*		
50	Step 38 - Step 48	VDC					0.25	
51	Step 39 - Step 48	VDC					0.25	
52	Maximum (ON state) CHANNEL 5 Voltage	VDC	27				29	
	Minimum (OFF state) CHANNEL 5 Voltage	VDC	0.00				5.0	
53	Maximum (OFF state) CHANNEL 6 Voltage	vrms	25.9				30.1	
	Minimum (ON state) CHANNEL 6 Voltage	vrms	0				5.0	

\* TO BE USED AS REQUIRED OR DESIRED

DATE 15 MAR 66  
FORM 00130  
Chg. 7-23 65

SUBSYSTEM LEM G & N SYSTEM

DESCRIPTION Provide Operate Control Test for IMU Time Delay, Gimbal Ambiguity, 1X Sin and Cos Signals, Standby to Operate Temperature Transient, 800 CPS P/S Thermistor, Temp. Mon. 1 Thermistor, PIPA Cal. Mod. Thermistor, Auto Cage, Inertial Temperature Control Point, Heater Telemetry Discrete, Blower Telemetry Discrete and Normalization.

Rev.	Date	TDRR NO.	PAGES REVISED	APPROVAL	REFERENCES
1	6-7-66	23401	All	MIT	NASA
2	7-5-66	30345	1,2,3	MM	ACOM
3	8-10-66	30550	All	EA	WSA
4	10-13-66	31512	1,2	EA	WSA
5	11-10-66	31902	3,4,5	EA	WSA
6	1-18-67	32667	6	EA	WSA
7	3-30-67	33468	1	EA	WSA

TOOLS AND Wheatstone bridge, MATERIAL 10 K ± 10% resistor

IMPORTANT: Insure that the G & N system has been in the STANDBY mode with LGC power ON for a minimum of 2 hours before proceeding with Step 12.

INITIALIZATION

- Deleted.
- Insure that the CGC/LGC POWER ON and the 400 CPS POWER ON pushbuttons are lit.
- Insure that the STBY lamp on the DSKY is not lighted. If lighted, press the STBY pushbutton until the STBY lamp goes out. Press ALARM RESET pushbutton on Programmer and Monitor panel of CTS.

VERIFICATION WITH SIDL REQUIRED BEFORE USE

DATE 15 MAR 66

SUBSYSTEM LEM G & N SYSTEM

17. When the DSKY registers display (approx):  
Row 1 + 225 --  
Row 2 + 225 --  
Row 3 + 225 --

Press the PROCEED/ISS STANDBY pushbutton on the Test Control panel. The ISS STANDBY portion shall light and the PROCEED/ISS OPERATE pushbutton shall go out.  
18. Record the time that the ISS was placed in the STANDBY mode.  
19. Set CHANNELS 3, 4, 5 and 6 of the Oscillograph Signal Selector panel to monitor the following signals:  
a. Acel Temperature on CHANNEL 3-3DC.  
b. IRIG Temperature on CHANNEL 4-3DC.  
c. IMU Heater Discrete on CHANNEL 5 AUX  
d. IMU Blower Discrete on CHANNEL 6 AUX

- Perform the following DSKY operations:  
a. VERB 11 NOUN 10 ENTR  
b. 00012 ENTR  
c. 0 ---- displayed  
14. Set the FUNCTION selector on the Counter to OFF immediately after the DSKY display changes from 0 ---- to 4 ----.  
15. Record the time displayed on the Counter.  
16. Perform the following DSKY operations:  
a. Enter VERB 41 NOUN 20 ENTR  
b. Observe VERB 21 NOUN 22 Flashing  
c. Enter VERB 21 NOUN 22 Flashing  
d. Observe VERB 22 NOUN 22 Flashing  
e. Enter VERB 22 NOUN 22 Flashing  
f. Observe VERB 23 NOUN 22 Flashing  
g. Enter VERB 23 NOUN 22 Flashing  
h. Enter VERB 16 NOUN 20 ENTR

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SUBSYSTEM LEM G & N SYSTEM

24. Zero and calibrate CHANNELS 3, 4, and 5 on the Oscillograph Amplifier. Calibrate CHANNEL 6 after entering the OPERATE mode.

- Mark the Oscillograph Channels as follows:  
a. CHANNEL 3 "start of PIPA TEMP stability test"  
b. CHANNEL 4 "start of IRIG TEMP stability test"  
c. CHANNEL 5 "start of IMU Heater Discrete"  
d. CHANNEL 6 "start of IMU Blower Discrete"

26. Set the CHART SPEEDS to 1 and RANGE to .2 V/CM on the Oscillograph Control for CHANNEL 3, 2 V/CM for CHANNEL 4 and 20 V/CM for CHANNELS 5 and 6. Start the Oscillograph by setting the CHART DRIVE switch to MM/SEC.  
NOTE: Read and understand steps 27 through 50.  
39, and 40 shall be performed 15 minutes after step 32. Steps 32 and 50 take precedence over steps 27 through 50.

GIMBAL AMBIGUITY TEST  
27. Perform the following DSKY operations:  
a. VERB 11 NOUN 10 ENTR  
b. 00012 ENTR

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SUBSYSTEM LEM G & N SYSTEM

1X SIN AND COS SIGNALS  
36. Perform the following DSKY operations:  
a. VERB 41 NOUN 20 ENTR  
b. +00000 ENTR  
c. +00000 ENTR  
d. +00000 ENTR

Set the PAVM FUNCTION selector to total and measure the following signals on the highest usable sensitivity of the meters.  
Record the indications:  
Signal  
a. Cos AOG 1X 241  
b. Cos AMG 1X 242  
c. Cos AIG 1X 243  
d. Sin AOG 1X 142  
e. Sin AMG 1X 143  
f. Sin AIG 1X 144

37. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 173. Adjust the G & N VOLTAGE ADJUST until the DVM indicates 28.00 (±0.25) VDC.  
STANDBY TO OPERATE TEMPERATURE TRANSIENT  
38. 15 minutes after performing step 31, press the EVENT MARKER on the Oscillograph Control panel and record the time and voltage indication of CHANNEL 3.  
39. 30 minutes after performing step 31 press the EVENT MARKER on the Oscillograph Control panel and record the time and voltage indicated on CHANNEL 4. Change the CHANNEL 4 Range to the smallest usable scale.

- Perform the following DSKY operations:  
a. Enter VERB 41 NOUN 20 ENTR  
b. Observe VERB 21 NOUN 22 Flashing  
c. Enter VERB 21 NOUN 22 Flashing  
d. Observe VERB 22 NOUN 22 Flashing  
e. Enter VERB 22 NOUN 22 Flashing  
f. Observe VERB 23 NOUN 22 Flashing  
g. Enter VERB 23 NOUN 22 Flashing  
h. Enter VERB 16 NOUN 20 ENTR

Row 1 +00500

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SUBSYSTEM	LEM G & N SYSTEM	ASSY
Row 2	+00500	
Row 3	+00500	
press and hold the IMU CAGE COMMAND pushbutton on the Test Control panel. Perform the following DSKY operation:		
VERB 36	ENTR	
NOTE: Disregard ISS WARNING light on Monitor Panel. The ISS WARNING light will extinguish in step 46.		
45. Set the PAVM FUNCTION selector to total and measure the following signals on the highest usable sensitivity of the meters. Record the indications:		
Signal	CROSSBAR CONTROL	
a. Sin AOG 1X	142	
b. Sin AMG 1X	143	
c. Sin AIG 1X	144	
46. Release the IMU CAGE COMMAND pushbutton on the Test Control Panel and perform the following DSKY operations:		
VERB 11	NOUN 10	ENTR
00012	ENTR	
47. Record the display of Row 1.		
INERTIAL TEMPERATURE CONTROL POINT		
48. Allow the PIPA and IRIG temperatures to stabilize as indicated by a voltage change of 0.05 volt or less over a one hour period. Stabilization should occur within 2 hours since performance of step 31. Record the average voltage indication for the stability period of CHANNELS 3 and 4. Stop the Oscillograph.		

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SUBSYSTEM	LEM G & N SYSTEM	ASSY
a. Enter	+00000	ENTR
d. Observe		
VERB 22	NOUN 22	Flashing
e. Enter	+00000	ENTR
f. Observe		
VERB 23	NOUN 22	Flashing
g. Enter	+00000	ENTR
h. Enter		
VERB 16	NOUN 20	ENTR

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APOLLO G & N  
EQUIPMENT TEST  
DATA SHEET 1 OF 3

JOB OPERATE CONTROL TEST

JDC  
NO. 12616  
REV. G  
INITIAL TDRR 27114

ASSEMBLY UNDER TEST		TEST HISTORY			
TITLE	DATE	START	END	SITE / LOCATION	
SER. NO.	DWG	REV	TIME	START	END
MAJOR GROUND SUPPORT EQUIPMENT					
NAME	SER. NO.	SER. NO.	CAL DATE	CAL DATE	
CONDUCTED BY NAME/AFFILIATION APPROVED BY NAME/AFFILIATION					
JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES	MAX VALUE
				1st	2nd*
				3rd*	REJ/ACC
6	DVM voltage	volts	27.50		28.50
15	Elapsed time	sec	85		95
18	Time	hr			
		min.			
27	CHANNEL 3 Voltage	VDC			
	CHANNEL 4 Voltage	VDC			
31	Time	hr			
		min			
32	PIPA torquing not present until after Display change				
35	OG Gimbal position				
	MG Gimbal position				
	IG Gimbal position				
	OG DSKY position				

\* TO BE USED AS REQUIRED OR DESIRED

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APOLLO G & N  
EQUIPMENT TEST  
DATA SHEET 2 OF 3

JOB OPERATE CONTROL TEST

JDC  
NO. 12616  
REV. G

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES	MAX VALUE	REJ/ACC
				1st	2nd*	3rd*
35	MG DSKY position					
(cont)	IG DSKY position					
36	Cos AOG 1X	vrms	23.4			28.5
	Cos AMG 1X	vrms	23.4			28.6
	Cos AIG 1X	vrms	23.4			28.6
	Sin AOG 1X	vrms	0.00			0.50
	Sin AMG 1X	vrms	0.00			0.50
	Sin AIG 1X	vrms	0.00			0.50
38	Time	min				
	Voltage	VDC				
39	Time	min				
	CHANNEL 4 Voltage	VDC				
40	800 C/P8/P8 temperature	ohms	12210			16,370
41	Temp Mon 1	ohms	11400			23,250
42	PIPA Cal. Mod.	ohms	13650			23,250
45	Sin AOG 1X	vrms	0.00			0.50
	Sin AMG 1X	vrms	0.00			0.50
	Sin AIG 1X	vrms	0.00			0.50
47	Row 1 display	xxxxx				xxxxx
48	CHANNEL 3 Voltage	VDC	-0.5			+1.0
	CHANNEL 4 Voltage	VDC	-1.25			+1.25
49	Step 27   Step 48	VDC				0.50

\* TO BE USED AS REQUIRED OR DESIRED

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APOLLO G & N  
EQUIPMENT TEST  
DATA SHEET 3 OF 3

**JOB OPERATE CONTROL TEST**

JDC  
NO. 126.6  
REV. G

JDC ITEM NO	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES			MAX VALUE	REF/ACC
				1st	2nd*	3rd*		
50	Step 38 - Step 48	VDC				0.25		
51	Step 39 - Step 48	VDC				0.25		
52	Maximum (ON state) CHANNEL 5 Voltage	VDC	27			29		
53	Minimum (OFF state) CHANNEL 5 Voltage	VDC	0.00			5.0		
	Maximum (OFF state) CHANNEL 6 Voltage	vrms	25.9			30.1		
	Minimum (ON state) CHANNEL 6 Voltage	vrms	0			5.0		

**\* TO BE USED AS REQUIRED OR DESIRED**

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SUBSYSTEM LEM G & N SYSTEM				ASSY.			
DESCRIPTION				Provide Operate Control Test for IMU Time Delay, Gimbal Ambiguity, 1X Sin and Cos Signals, Standby to Operate Temperature Transient, 800 CPS P/S Thermistor, Temp. Mon. 1 Thermistor, PIPA Cal. Mod. Thermistor, Auto Cage, Inertial Temperature Control Point, Heater Telemetry Discrete, Blower Telemetry Discrete and Normalization.			
Rev.	Date	TORR NO.	PAGES REVISED	APPROVAL	REFERENCES PS-6015000		
Let.			JDC	D.S.	MIT	NASA	
A	6-7-66	29401	ALL	ALL	MM	ACM	
B	7-5-66	30045	1,2,3	-	MM	WS	IMPORTANT
C	8-10-66	30550	ALL	ALL	EA	WS	
D	10-13-66	31512	1,2	-	EA	-	
E	11-10-66	31902	3,4,5	-	EA	-	
F	1-18-67	32667	6	1,2	EA	-	INTERVAL
G	3-30-67	33468	1	2	EA	-	
H	8-10-67	34337	1,3,4,5	1,2	EA	-	TOOLS AND Wheatstone bridge MATERIAL 10 K ± 10% resis or

IMPORTANT: 1. Insure that the G & N system has been in the STANDBY mode with LGC power ON for a minimum of 2 hours before proceeding with Step 12.

2. Oscillograph sensitivities given in this JDC are nominal values to be used as a guide. Operator may change sensitivities as required.

3. In some steps the DSKY operations and displays required when the LGC contains Program Aurora 88 (2021101-021)

are different from the DSKY operations and displays required when the LGC contains Program Aurora 85 (2021101-011). These differences are noted within the procedures.

INITIALIZATION

- Deleted.
- Insure that the CGC/LGC POWER ON and the 400 CPS POWER ON pushbuttons are lit.
- Insure that the STBY lamp on the DSKY is not lighted. If lighted, press the STBY pushbutton until the STBY lamp goes out. Press ALARM RESET pushbutton on Programmer and monitor panel of CTS.

VERIFICATION WITH SIDL REQUIRED BEFORE USE

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ASSY			
a.	Enter	VERB 41	NOUN 20 ENTR
b.	Observe	VERB 21	NOUN 22 Flashing
c.	Enter	+22500	ENTR
d.	Observe	VERB 22	NOUN 22 Flashing
e.	Enter	+22500	
f.	Observe	VERB 23	NOUN 22 Flashing
g.	Enter	+22500	ENTR
h.	Enter	VERB 16	NOUN 20 ENTR
17. When the DSKY registers display (approx):			
Row 1 + 225 --			
Row 2 + 225 --			
Row 3 + 225 --			
Press the PROCEED/ISS STANDBY pushbutton on the Test Control panel. The ISS STANDBY portion shall light and the PROCEED/ISS OPERATE pushbutton shall go out.			
18. Record the time that the ISS was placed in the STANDBY mode.			
19. Set CHANNELS 3, 4, 5 and 6 of the Oscillograph Signal Selector panel to monitor the following signals:			
a. Accel Temperature on CHANNEL 3-3DC.			
b. IRIG Temperature on CHANNEL 4-3DC.			
c. IMU Heater Discrete on CHANNEL 5 AUX			
d. IMU Blower Discrete on CHANNEL 6 AUX			
20. Insure that the CHANNEL 3 DC, CHANNEL 4 DC, CHANNEL 5 DC and CHANNEL 6			

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ASSY			
AC pushbuttons on the Oscillograph Signal Selector panel are lighted.			
21. Connect a jumper from TPA #2 TB4-21 (ht) and TPA #2 TB5-22 (lo) to TPA #2 DIRECT PROBES J9 (ht) and J10 (lo) respectively.			
22. Connect a jumper from PROBES OUTPUT, DIRECT to CH 5, IN-DC on the Auxiliary Input Panel.			
23. Connect jumpers from TPA #2 TB4-20 (ht) and TPA #2 TB5-33 (lo) to CH 6, IN-AC on the Auxiliary Input Panel.			
24. Zero and calibrate CHANNELS 3, 4, and 5 on the Oscillograph Amplifier. Calibrate CHANNEL 6 after entering the OPERATE mode.			
25. Mark the Oscillograph Channels as follows:			
a. CHANNEL 3 "start of PIPA TEMP stability test"			
b. CHANNEL 4 "start of IRIG TEMP stability test"			
c. CHANNEL 5 "start of IMU Heater Discrete"			
d. CHANNEL 6 "start of IMU Blower Discrete"			
26. Set the CHART SPEEDS to 1 and RANGE to .2 V/CM on the Oscillograph Control for CHANNEL 3, 2 V/CM for CHANNEL 4 and 20 V/CM for CHANNELS 5 and 6. Start the Oscillograph by setting the CHART DRIVE switch to MM/SEC.			

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ASSY			
e.	Sin AMG IX	143	
f.	Sin AIG IX	144	
37. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to I73. Adjust the G & N VOLTAGE ADJUST until the DVM indicates 28.00 (±0.25) VDC.			
STANDBY TO OPERATE TEMPERATURE TRANSIENT			
38. 15 minutes after performing step 31, press the EVENT MARKER on the Oscillograph Control panel and record the time.			
Immediately set the CROSSBAR CONTROL to 255 and monitor and record the PIPA temperature deviation as indicated on the DVM.			
39. 30 minutes after performing step 31, press the EVENT MARKER on the Oscillograph Control panel and record the time.			
Change the CHANNEL 4 Range to the smallest usable scale. Immediately set the CROSSBAR CONTROL to 156 and monitor and record the IRIG temperature deviation as indicated on the DVM.			
800 CPS P/S THERMISTOR			
40. Insert a 10 K resistor in series with the Wheatstone bridge. Measure and record 800 cps P/S Temperature thermistor resistance across pins TB5-12 and TB5-13 on TPA #2.			
TEMP MON 1 THERMISTOR			
41. Measure and record the Temp Mon 1 thermistor resistance across pins TB5-14 and TB5-15 of TPA #2.			
PIPA CAL. MOD. THERMISTOR			
42. Measure and record PIPA Cal. Mod.			

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SUBSYSTEM		ASSY
thermistor resistance across TBI-31 and TBI-27 on TPA #2.		
IMU CAGE		
43. Perform the following DSKY operations:		
a. Enter	VERB 41 NOUN 20 ENTR	CROSSBAR CONTROL 142
b. Observe	VERB 21 NOUN 22 Flashing	143
c. Enter	+00500 ENTR	144
d. Observe	VERB 22 NOUN 22 Flashing	
e. Enter	+00500 ENTR	
f. Observe	VERB 23 NOUN 22 Flashing	
g. Enter	+00500 ENTR	
h. Enter	VERB 16 NOUN 20 ENTR	
44. When the DSKY registers display (approx):		
Row 1	+00500	
Row 2	+00500	
Row 3	+00500	
press and hold the IMU CAGE COMMAND pushbutton on the Test Control panel. Perform the following DSKY operation:		
VERB 36	ENTR	
NOTE: Disregard ISS WARNING light on Monitor Panel. The ISS WARNING light will extinguish in step 46.		
45. Set the PAVM FUNCTION selector to total and measure the following signals on the highest usable sensitivity of the meters.		

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SUBSYSTEM		ASSY
the difference.		
HEATER TELEMETRY DISCRETE		
52. Record the maximum and minimum voltage indicated on CHANNEL 5.		
BLOWER TELEMETRY DISCRETE		
53. Record the minimum and/or maximum voltage indicated on CHANNEL 6 or both if the blower is cycling.		
NORMALIZATION		
54. Upon completion of the data sheets, make a copy of the data sheets and forward one set immediately to:		
IMU Thermo Design Group		
MS 99		
Instrumentation Laboratory		
75 Cambridge Parkway		
Cambridge, Massachusetts 02142		
55. Perform the following DSKY operations:		
a. Enter	VERB 41 NOUN 20 ENTR	
b. Observe	VERB 21 NOUN 22 Flashing	
c. Enter	+00000 ENTR	
d. Observe	VERB 22 NOUN 22 Flashing	
e. Enter	+00000 ENTR	
f. Observe	VERB 23 NOUN 22 Flashing	
g. Enter	+00000 ENTR	
h. Enter	VERB 16 NOUN 20 ENTR	

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APOLLO G&N  
EQUIPMENT TEST  
DATA SHEET 1 OF 3

JOB OPERATE CONTROL TEST

JDC  
NO. 12616  
REV. H  
INITIAL TDRR 27134

ASSEMBLY UNDER TEST		TEST HISTORY	
TITLE	DATE	START	END
SER. NO.	DWG	TIME	SITE / LOCATION
MAJOR GROUND SUPPORT EQUIPMENT			
NAME	SER. NO.	SER. NO.	CAL DATE
NAME	SER. NO.	SER. NO.	CAL DATE
CONDUCTED BY NAME/AFFILIATION APPROVED BY NAME/AFFILIATION			
JDC ITEM NO.	PARAMETER	UNITS	RECORDED VALUES
			1st 2nd* 3rd*
6	DVM voltage	volts	27.50 28.50
15	Elapsed time	sec	85 95
18	Time	hr min	
28	PIPA Temperature Deviation (Standby)	VDC	
29	IRIG Temperature Deviation (Standby)	VDC	
31	Time	hr min	
32	PIPA torquing not present until after Display change		
35	OG Gimbal position		
	MG Gimbal position		
	IG Gimbal position		
	OG DSKY position		

\* TO BE USED AS REQUIRED OR DESIRED

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APOLLO G & N  
EQUIPMENT TEST  
DATA SHEET 2 OF 3

JOB OPERATE CONTROL TEST

JDC  
NO. 12616  
REV. H

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES	MAX VALUE	REJ ACC
				1st 2nd* 3rd*		
35	MG DSKY position (cont)					
36	IG DSKY position					
	Cos AOG 1X	vrms	23.4		28.6	
	Cos AMG 1X	vrms	23.4		28.6	
	Cos AIG 1X	vrms	23.4		28.6	
	Sin AOG 1X	vrms	0.00		0.50	
	Sin AMG 1X	vrms	0.00		0.50	
	Sin AIG 1X	vrms	0.00		0.50	
38	Time	min				
	PIPA Temperature Deviation (Operate 15 min)	VDC				
39	Time	min				
	IRIG Temperature Deviation (Operate 30 min)	VDC				
40	800 CPS/PS temperature	ohms	12210		18,370	
41	Temp Mon 1	ohms	11400		23,250	
42	PIPA Cal. Mod.	ohms	13650		23,250	
45	Sin AOG 1X	vrms	0.00		0.50	
	Sin AMG 1X	vrms	0.00		0.50	
	Sin AIG 1X	vrms	0.00		0.50	
47	Row 1 display		xxxxx (xxx3x)*		xxxxx (xxx3x)*	
48	PIPA Temperature Deviation (Operate stabilized)	VDC	-0.5		+1.0	

\* TO BE USED AS REQUIRED OR DESIRED

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APOLLO G & N  
EQUIPMENT TEST  
DATA SHEET 3 OF 3

JDC
NO. 12616
REV H

JOB OPERATE CONTROL TEST

JDC ITEM NO	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES			MAX VALUE	REJ ACC
				1st	2nd*	3rd*		
48	IRIG Temperature	VDC	-1.25				+1.25	
(cont)	Deviation (Operate stabilized							
49	Step 28 - Step 48	VDC					0.50	
50	Step 38 - Step 48	VDC					0.25	
51	Step 39 - Step 48	VDC					0.25	
52	Maximum (ON state) CHANNEL 5 Voltage	VDC	27				29	
	Minimum (OFF state) CHANNEL 5 Voltage	VDC	0.00				5.0	
53	Maximum (OFF state) CHANNEL 6 Voltage	v rms	25.9				30.1	
	Minimum (ON state) CHANNEL 6 Voltage	v rms	0				5.0	

\* TO BE USED AS REQUIRED OR DESIRED

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SUBSYSTEM LEM G & N SYSTEM				ASSY.			
DESCRIPTION Provide Operate Control Test for IMU Time Delay, Gimbal Ambiguity, 1X Sin and Cos Signals, Standby to Operate Temperature Transient, 800 CPS P/S Thermistor, Temp. Mon. 1 Thermistor, PIPA Cal. Mod. Thermistor, Auto Cage, Inertial Temperature Control Point, Heater Telemetry Discrete, Blower Telemetry Discrete and Normalization.							
REFERENCES PS-6015000							
Rev.	Date	TDDR NO.	PAGES REVISED		APPROVAL		
Let.			JDC	D.S.	MIT	NASA	
A	6-7-66	29401	All	All	MM	ACM	
B	7-5-66	30043	1,2,3	-	MM	WSJ	
C	8-10-66	30530	All	All	EA	WSJ	
D	10-13-66	31512	1,2	-	EA	WSJ	
E	11-10-66	31902	3,4,5	-	EA	WSJ	
F	1-18-67	32667	6	1,2	EA	WSJ	
G	3-30-67	33468	1	2	EA	WSJ	
H	8-10-67	34337	1,3,4,5	1,2	EA	WSJ	
J	8-31-67	34456	-	1,2	EA	WSJ	
TOOLS AND Wheatstone bridges MATERIAL 10 K ± 10% resistor							

IMPORTANT: 1. Insure that the G & N system has been in the STANDBY mode with LGC power ON for a minimum of 2 hours before proceeding with Step 12.

2. Oscillograph sensitivities given in this JDC are nominal values to be used as a guide. Operator may change sensitivities as required.

3. In some steps the DSKY operations and displays required when the LGC contains Program Aurora 88 (2021101-021)

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Chg. 3 1-66

4. Insure that the PROCEED lamp on the PROCEED/ISS OPERATE pushbutton is lit.

5. Insure that the PSA HTR. PWR lamp on the Temperature Monitor panel is lighted.

6. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 175. Adjust the G & N VOLTAGE ADJUST until the DVM indicates 28.0 ( $\pm 0.5$ ) vdc. Record indication.

IMU TIME DELAY

7. Deleted.

8. Deleted.

9. Deleted.

10. Deleted.

11. Set switches and controls on the Counter as follows:

DISPLAY RESET to ZERO

CLOCK FREQUENCY DIVIDER to  $10^4$

CLOCK SELECTOR to INT

INPUT SELECTOR to C SENSE

SENSE SELECTOR to FWD

FUNCTION to COUNT

12. Simultaneously press the RESET pushbutton on the Counter and the PROCEED/ISS OPERATE pushbutton on the Test Control panel.

13. Perform the following DSKY operations:

a. VERB 11 NOUN 10 ENTR

b. 00012

c. 0. --- displayed

14. Set the FUNCTION selector on the Counter to OFF immediately after the DSKY display changes from 0. --- to 4. ---.

15. Record the time displayed on the Counter.

16. Perform the following DSKY operations:

17. When the DSKY registers display (approx):

Row 1 + 225 --

Row 2 + 225 --

Row 3 + 225 --

Press the PROCEED/ISS STANDBY pushbutton on the Test Control panel. The ISS STANDBY portion shall light and the PROCEED/ISS OPERATE pushbutton shall go out.

18. Record the time that the ISS was placed in the STANDBY mode.

19. Set CHANNELS 3, 4, 5 and 6 of the Oscillograph Signal Selector panel to monitor the following signals:

a. Accel Temperature on CHANNEL 3-3DC.

b. IRIG Temperature on CHANNEL 4-3DC.

c. IMU Heater Discrete on CHANNEL 5 AUX

d. IMU Blower Discrete on CHANNEL 6 AUX

20. Insure that the CHANNEL 3 DC, CHANNEL 4 DC, CHANNEL 5 DC and CHANNEL 6

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AC pushbuttons on the Oscillograph Signal Selector panel are lighted.

21. Connect a jumper from TPA #2 TB4-21 (hd) and TPA #2 TB5-22 (lo) to TPA #2 DIRECT PROBES J9 (hd) and J10 (lo) respectively.

22. Connect a jumper from PROBES OUTPUT, DIRECT to CH 5, IN-DC on the Auxiliary Input Panel.

23. Connect jumpers from TPA #2 TB4-20 (hd) and TPA #2 TB5-33 (lo) to CH 6, IN-AC on the Auxiliary Input Panel.

24. Zero and calibrate CHANNELS 3, 4, and 5 on the Oscillograph Amplifier. Calibrate CHANNEL 6 after entering the OPERATE mode.

25. Mark the Oscillograph Channels as follows:

a. CHANNEL 3 "start of PIPA TEMP stability test"

b. CHANNEL 4 "start of IRIG TEMP stability test"

c. CHANNEL 5 "start of IMU Heater Discrete"

d. CHANNEL 6 "start of IMU Blower Discrete"

26. Set the CHART SPEEDS to 1 and RANGE to .2 V/CM on the Oscillograph Control for CHANNEL 3, 2 V/CM for CHANNEL 4 and 20 V/CM for CHANNELS 5 and 6. Start the Oscillograph by setting the CHART DRIVE switch to MM/SEC.

NOTE: Read and understand steps 27 through 50 noting that steps 38, 39, and 40 shall be performed 15 minutes after step 32. Steps 32 and 50 take precedence over steps 27 through 50.

GIMBAL AMBIGUITY TEST

27. Perform the following DSKY operations:

a. VERB 11 NOUN 10 ENTR

b. 00012

27A. Allow the PIPA temperature to stabilize as indicated by a voltage change of 0.06 volt or less over a one hour period on CHANNEL 3.

28. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 255, and monitor and record the PIPA temperature deviation as indicated on the DVM.

29. Set the CROSSBAR CONTROL to 156 and monitor and record the IRIG temperature deviation as indicated on the DVM.

30. Press the PROCEED/ISS OPERATE pushbutton on the Test Control panel.

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e. Sin AMG 1X 143

f. Sin AIG 1X 144

37. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 173. Adjust the G & N VOLTAGE ADJUST until the DVM indicates 28.00 ( $\pm 0.25$ ) VDC.

STANDBY TO OPERATE TEMPERATURE TRANSIENT

38. 15 minutes after performing step 31, press the EVENT MARKER on the Oscillograph Control panel and record the time.

Immediately set the CROSSBAR CONTROL to 255 and monitor and record the PIPA temperature deviation as indicated on the DVM.

39. 30 minutes after performing step 31, press the EVENT MARKER on the Oscillograph Control panel and record the time.

Change the CHANNEL 4 Range to the smallest usable scale. Immediately set the CROSSBAR CONTROL to 156 and monitor and record the IRIG temperature deviation as indicated on the DVM.

800 CPS P/S THERMISTOR

40. Insert a 10 K resistor in series with the Wheatstone bridge. Measure and record 800 cps P/S Temperature thermistor resistance across pins TB5-12 and TB5-13 on TPA #2.

TEMP MON 1 THERMISTOR

41. Measure and record the Temp Mon 1 thermistor resistance across pins TB5-14 and TB5-15 of TPA #2.

PIPA CAL. MOD. THERMISTOR

42. Measure and record PIPA Cal. Mod.

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EQUIPMENT TEST  
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JOB OPERATE CONTROL TEST

JDC
NO. 12616
REV. J

JDC ITEM NO	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES			MAX VALUE	REJ/ACC
				1st	2nd*	3rd*		
48	PIPA Temperature Deviation (Operate stabilized)	VDC	-0.5				+1.0	
	IRIG Temperature Deviation (Operate stabilized)	VDC	-1.25				+1.25	
49	Step 28 - Step 48	VDC					0.50	
50	Step 38 - Step 48	VDC					0.25	
51	Step 39 - Step 48	VDC					0.25	
52	Maximum (ON state) CHANNEL 5 Voltage	VDC	27				29	
	Minimum (OFF state) CHANNEL 5 Voltage	VDC	0.00				5.0	
53	Maximum (OFF state) CHANNEL 6 Voltage	vrms	25.9				30.1	
	Minimum (ON state) CHANNEL 6 Voltage	vrms	0				5.0	

\* TO BE USED AS REQUIRED OR DESIRED

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FORM 00150  
Chg. 1-3-65



Rev	Date	TDOR	PAGES REVISED	APPROVAL	REFERENCES
1	6-7-66	29401	All	MIT NASA	REFERENCES PS-6015000
2	7-5-66	30245	1,2,3	MM ACM	
3	8-10-66	30330	All	EA WS	IMPORTANT
4	10-13-66	31512	1,2	EA	
5	11-10-66	31902	3,4,5	EA	
6	1-18-67	32667	6	EA	INTERVAL
7	3-30-67	33468	1	EA	
8	4-10-67	34337	1,3,4,5	EA	TOOLS AND Wheatstone bridge, MATERIAL 10 K & 10% resistor
9	8-31-67	34456	1,2	EA	
10	3-28-68	35979	All	EA	

**IMPORTANT:** 1. Insure that the G & N system has been in the STANDBY mode with LGC power ON for a minimum of 2 hours before proceeding with Step 12.

2. Oscilloscope sensitivities given in this JDC are nominal values to be used as a guide. Operator may change sensitivities as required.

3. In some steps the DSKY operations and displays required when the LGC contains Program Aurora 88 (2021101-021 or -031)

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are different from the DSKY operations and displays required when the LGC contains Program Aurora 88 (2021101-011). These differences are noted within the procedures.

#### INITIALIZATION

- Deleted.
- Insure that the CGC/LGC POWER ON and the 400 CPS POWER ON pushbuttons are lit.

- Insure that the STBY lamp on the DSKY is not lighted. If lighted, press the PRO (or STBY) pushbutton until the STBY lamp goes out. Press ALARM RESET pushbutton on Programmer and Monitor panel of CTS.

SUBSYSTEM	LEM G & N SYSTEM	ASSY
1. Insure that the PROCEED lamp on the PROCEED/ISS OPERATE pushbutton is lit.	a. VERB 41 NOUN 20 ENTR	
5. Insure that the PEA HTR. PWR lamp on the Temperature Monitor panel is lighted.	b. Observe: VERB 21 NOUN 22 Flashing	
6. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 175. Adjust the G & N POWER ADJUST until the DVM indicates 28.0 (±0.5) vdc. Record indication.	c. +22500 ENTR	
IMU TIME DELAY	d. Observe: VERB 22 NOUN 22 Flashing	
7. Deleted.	e. +22500 ENTR	
8. Deleted.	f. Observe: VERB 23 NOUN 22 Flashing	
9. Deleted.	g. +22500 ENTR	
10. Deleted.	h. VERB 16 NOUN 20 ENTR	
11. Set switches and controls on the Counter as follows:	17. When the DSKY registers display: Row 1 +22500 ±00500	
DISPLAY RESET to ZERO	Row 2 +22500 ±00500	
CLOCK FREQUENCY DIVIDER to 10 <sup>4</sup>	Row 3 +22500 ±00500	
CLOCK SELECTOR to INT	Press the PROCEED/ISS STANDBY pushbutton on the Test Control panel. The ISS STANDBY portion shall remain lighted and the PROCEED/ISS OPERATE pushbutton shall go out. GIM-BAL LOCK and NO ATT lamps on DSKY will light.	
SENSE SELECTOR to FWD	18. Record the time that the ISS was placed in the STANDBY mode.	
FUNCTION to COUNT	19. Set CHANNELS 3, 4, 5, and 6 of the Oscilloscope Signal Selector panel to monitor the following signals:	
12. Simultaneously press the RESET pushbutton on the Counter and the PROCEED/ISS OPERATE pushbutton on the Test Control panel.	a. Accel Temperature on CHANNEL 3-3.	
13. Perform the following DSKY operations:	b. IRIG Temperature on CHANNEL 4-3.	
a. VERB 11 NOUN 10 ENTR	c. IMU Heater Discrete on CHANNEL 5-15.	
b. 00012 ENTR	d. IMU Blower Discrete on CHANNEL 6-15.	
c. 0- - - - - displayed	20. Insure that CH 3 DC, CH 4 DC, CH 5 DC and CH 6 AC pushbuttons on the Oscilloscope Signal Selector panel are lighted.	
14. Set the FUNCTION selector on the Counter to OFF immediately after the DSKY display changes from 0- - - - - to 4- - - - -.	16. Perform the following DSKY operations:	
15. Record the time displayed on the Counter.		

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SUBSYSTEM	LEM G & N SYSTEM	ASSY
AC pushbuttons on the Oscilloscope Signal Selector panel are lighted.	NOTE: Read and understand steps 27 through 49 noting that steps 38 and 39 shall be performed 15 and 30 minutes after step 31. Steps 31 and 48 take precedence over steps 27 through 48.	
21. Connect a jumper from TPA #2 TB4-21 (hi) and TPA #2 TB5-22 (lo) to TPA #2 DIRECT PROBES J9 (hi) and J10 (lo) respectively.	TURN-ON CAGE TEST AND CDU AMBIGUITY TEST	
22. Connect a jumper from PROBES OUTPUT, DIRECT to CH 5, IN-DC on the Auxiliary Input Panel.	27. Perform the following DSKY operations:	
23. Connect jumpers from TPA #2 TB4-20 (hi) and TPA #2 TB5-33 (lo) to CH 6, IN-AC on the Auxiliary Input Panel.	a. VERB 11 NOUN 10 ENTR	
24. Zero and calibrate CHANNELS 3, 4, and 5 on the Oscilloscope Amplifier. Calibrate CHANNEL 6 after entering the OPERATE mode.	b. 00012 ENTR	
25. Mark the Oscilloscope Channels as follows:	27A. Allow the PIPA temperature to stabilize as indicated by a voltage change of 0.18 volt or less over a one hour period on CHANNEL 3.	
a. CHANNEL 3 "start of PIPA TEMP stability test"	28. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 255, and monitor and record the PIPA temperature deviation as indicated on the DVM.	
b. CHANNEL 4 "start of IRIG TEMP stability test"	29. Set the CROSSBAR CONTROL to 156 and monitor and record the IRIG temperature deviation as indicated on the DVM.	
c. CHANNEL 5 "start of IMU Heater Discrete"	30. Press the PROCEED/ISS OPERATE pushbutton on the Test Control panel.	
d. CHANNEL 6 "start of IMU Blower Discrete"		
26. Set the CHART SPEEDS to 1 and RANGE to .2 V/CM on the Oscilloscope Control for CHANNEL 3, 2 V/CM for CHANNEL 4 and 20 V/CM for CHANNELS 5 and 6. Start the Oscilloscope by setting the CHART DRIVE switch to MM/SEC.		

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SUBSYSTEM	LEM G & N SYSTEM	ASSY
31. Press the EVENT MARKER on the Oscilloscope Control Panel immediately after step 30 and record the time.	e. Sin A MG IX 143	
32. Verify and record by observing the PIPA Monitor Scope that no PIPA torquing is present until after the DSKY display changes from 00030 to 40000 to 00000.	f. Sin A IG IX 144	
33. Press the EVENT MARKER on the Oscilloscope Control panel immediately after the DSKY display changes from 00030 to 40000 to 00000.	37. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 175. Adjust the G & N POWER ADJUST until the DVM indicates 28.00 (±0.25) VDC.	
34. After the DSKY display changes from 00030 to 40000 to 00000 perform the following DSKY operation:	STANDBY TO OPERATE TEMPERATURE TRANSIENT	
a. VERB 16 NOUN 20 ENTR	38. 15 minutes after performing step 31, press the EVENT MARKER on the Oscilloscope Control panel and record the time.	
35. Record the OG, MG, and IG positions as indicated on the Gimbal Position Control panel and as indicated on the DSKY displays.	Immediately set the CROSSBAR CONTROL to 255 and monitor and record the PIPA temperature deviation as indicated on the DVM.	
36. Perform the following DSKY operations:	39. 30 minutes after performing step 31 press the EVENT MARKER on the Oscilloscope Control panel and record the time. Change the CHANNEL 4 Range to the smallest usable scale. Immediately set the CROSSBAR CONTROL to 156 and monitor and record the IRIG temperature deviation as indicated on the DVM.	
a. VERB 41 NOUN 20 ENTR	800 CPS P/S THERMISTOR	
b. +00000 ENTR	40. Insert a 10 K resistor in series with the Wheatstone bridge. Measure and record 800 cps P/S Temperature thermistor resistance across pins TB5-12 and TB5-13 on TPA #2.	
c. +00000 ENTR	TEMP MON 1 THERMISTOR	
d. +00000 ENTR	41. Measure and record the Temp Mon 1 thermistor resistance across pins TB5-14 and TB5-15 of TPA #2.	
Set the PAVM FUNCTION selector to total and measure the following signals on the highest usable sensitivity of the meters.	PIPA CAL. MOD. THERMISTOR	
Record the indications:	42. Measure and record PIPA Cal. Mod.	
Signal		
a. Cos A OG IX 241		
b. Cos A MG IX 242		
c. Cos A IG IX 243		
d. Sin A OG IX 142		

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thermistor resistance across TBI-31 and TBI-27 on TPA #2.

IMU CAGE

43. Perform the following DSKY operations:

a. VERB 41 NOUN 20 ENTR

b. Observe: VERB 21 NOUN 22 Flashing ENTR

c. +00500

d. Observe: VERB 22 NOUN 23 Flashing ENTR

e. +00500

f. Observe: VERB 23 NOUN 22 Flashing ENTR

g. +00500

h. VERB 16 NOUN 20 ENTR

44. When the DSKY registers display (approx):

Row 1 +00500

Row 2 +00500

Row 3 +00500

press and hold the IMU CAGE COMMAND pushbutton on the Test Control panel. Perform the following DSKY operation:

VERB 36 ENTR

NOTE: Disregard ISS WARNING light on Monitor Panel.

The ISS WARNING light will extinguish in step 46.

45. Set the PAYM FUNCTION selector to total and measure the following signals on the highest usable sensitivity of the meters.

Record the indications:

Signal CROSSBAR CONTROL

a. Sin AOG LX 142

b. Sin AMG LX 143

c. Sin AIG LX 144

46. Release the IMU CAGE COMMAND pushbutton on the Test Control Panel and perform the following DSKY operations:

VERB 11 NOUN 10 ENTR

00012 ENTR

47. Record the display of Row 1.

INERTIAL TEMPERATURE CONTROL POINT

48. Allow the PIPA and IRIG temperatures to stabilize as indicated by a voltage change of 0.05 volt or less over a one hour period as monitored on the Oscilloscope. Stabilization should occur within 2 hours after performance of step 31. Set CROSSBAR CONTROL to 265 and monitor and record the PIPA temperature deviation as indicated on the DVM.

Set the CROSSBAR CONTROL to 156 and monitor and record the IRIG temperature deviation as indicated on the DVM. Stop the Oscilloscope.

49. Compare the PIPA STANDBY temperature deviation from step 28 with the PIPA temperature recorded in step 48. Calculate and record the difference.

50. Compare the PIPA temperature recorded in step 38 with the PIPA temperature recorded in step 48. Calculate and record the difference.

51. Compare the IRIG temperature recorded in step 39 with the IRIG temperature

recorded in step 48. Calculate and record the difference.

HEATER TELEMETRY DISCRETE

52. Record the maximum and minimum voltage indicated on CHANNEL 5.

BLOWER TELEMETRY DISCRETE

53. Record the minimum and/or maximum voltage indicated on CHANNEL 6 or both if the blower is cycling.

NORMALIZATION

54. Upon completion of the data sheets, make a copy of the data sheets and forward one set immediately to:

IMU Thermo Design Group

MS 99

Instrumentation Laboratory

76 Cambridge Parkway

Cambridge, Massachusetts 02142

55. Perform the following DSKY operations:

a. VERB 36 ENTR

b. VERB 41 NOUN 20 ENTR

c. Observe: VERB 21 NOUN 22 Flashing ENTR

d. +00000

e. Observe: VERB 22 NOUN 22 Flashing ENTR

f. +00000

g. Observe: VERB 23 NOUN 22 Flashing ENTR

h. +00000

i. VERB 16 NOUN 20 ENTR

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ASSEMBLY UNDER TEST

TITLE \_\_\_\_\_ DATE \_\_\_\_\_ START \_\_\_\_\_ END \_\_\_\_\_ SITE / LOCATION \_\_\_\_\_

SER. NO. \_\_\_\_\_ DWG \_\_\_\_\_ REV. \_\_\_\_\_ TIME \_\_\_\_\_ START \_\_\_\_\_ END \_\_\_\_\_ TOTAL ELAPSED \_\_\_\_\_

MAJOR GROUND SUPPORT EQUIPMENT

NAME \_\_\_\_\_ SER. NO. \_\_\_\_\_ CAL DATE \_\_\_\_\_

NAME \_\_\_\_\_ SER. NO. \_\_\_\_\_ CAL DATE \_\_\_\_\_

CONDUCTED BY \_\_\_\_\_ NAME/AFFILIATION \_\_\_\_\_ APPROVED BY \_\_\_\_\_ NAME/AFFILIATION \_\_\_\_\_

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES			MAX VALUE	REJ ACC
				1st	2nd*	3rd*		
6	DVM voltage	volts	27.50				28.50	
15	Elapsed time	sec	85				95	
18	Time	hr						
		min						
28	PIPA Temperature Deviation (Standby)	VDC						
29	IRIG Temperature Deviation (Standby)	VDC						
31	Time	hr						
		min						
32	PIPA torquing not present until after Display change							
35	OG Gimbal position							
	MG Gimbal position							
	IG Gimbal position							
	OG DSKY position (Row 1)							

\* TO BE USED AS REQUIRED OR DESIRED

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JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES			MAX VALUE	REJ ACC
				1st	2nd*	3rd*		
35 (cont)	MG DSKY position (Row 3)							
	IG DSKY position (Row 2)							
36	Cos AOG LX	vrms	23.4				28.6	
	Cos AMG LX	vrms	23.4				28.6	
	Cos AIG LX	vrms	23.4				28.6	
	Sin AOG LX	vrms	0.00				0.50	
	Sin AMG LX	vrms	0.00				0.50	
	Sin AIG LX	vrms	0.00				0.50	
38	Time	min						
	PIPA Temperature Deviation (Operate 15 min)	VDC						
39	Time	min						
	IRIG Temperature Deviation (Operate 30 min)	VDC						
40	800 CFB/PS temperature	ohms	12210				18,370	
41	Temp Mon 1	ohms	11400				23,250	
42	PIPA Cal. Mod.	ohms	13650				23,250	
45	Sin AOG LX	vrms	0.00				0.50	
	Sin AMG LX	vrms	0.00				0.50	
	Sin AIG LX	vrms	0.00				0.50	
47	Row 1 display		xxxxx** (xxx3x)				xxxxx** (xxx3x)	

\* To be used as required or desired

\*\* MIN and MAX VALUES shown in parentheses apply to Program Aurora 88

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APOLLO G & N  
EQUIPMENT TEST  
DATA SHEET OF 3

JOB OPERATE CONTROL TEST

JDC  
NO. 12616  
REV. K

JDC ITEM NO	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES			MAX VALUE	REJ ACC
				1st	2nd*	3rd*		
48	PIPA Temperature Deviation (Operate stabilized)	VDC	-0.5				+1.0	
	IRIG Temperature Deviation (Operate stabilized)	VDC	-1.25				+1.25	
49	Step 28 - Step 48	VDC					0.50	
50	Step 38 - Step 48	VDC					0.25	
51	Step 39 - Step 48	VDC					0.25	
52	Maximum (OFF state) CHANNEL 5 Voltage	VDC	19.5				33.5	
	Minimum (ON state) CHANNEL 5 Voltage	VDC	-5.0				+5.0	
53	Maximum (OFF state) CHANNEL 6 Voltage	VDC	25.2				30.8	
	Minimum (ON state) CHANNEL 6 Voltage	VDC	-5.0				+5.0	

\* TO BE USED AS REQUIRED OR DESIRED

DATE 15 MAR 56

1000-1015  
CNC-1-3-G

DESCRIPTION Provide Operate Control Test for IMU Time Delay, Gimbal Ambiguity, 1X Sin and Cos Signals, Standby to Operate Temperature Transient, 800 CPS P/S Thermistor, Temp. Mon. 1 Thermistor, PIPA Cal. Mod. Thermistor, Auto Care, Inertial Temperature Control Point, Heater Telemetry Discrete, Blower Telemetry Discrete and Normalization. REFERENCES PG-4015000

Rev.	Date	TDR	PAGES REVISED	APPROVAL
Let.		NO.	JDC	D.S.
A	6-7-66	29401	ALL	MM
B	7-5-66	30043	1,2,3	MM
C	8-10-66	30530	ALL	EA
D	10-13-66	31512	1,2	EA
E	11-10-66	31902	3,4,5	EA
F	1-18-67	32667	6	EA
G	3-30-67	33468	1	EA
H	8-10-67	34337	1,3,4,5	EA
J	8-31-67	34456	1,2	EA
K	3-28-68	35979	ALL	EA
L	1-9-68	36043	1	EA

IMPORTANT: 1. Insure that the G & N system has been in the STANDBY mode with LOC power ON for a minimum of 2 hours before proceeding with Step 12.

2. Oscilloscope sensitivities given in this JDC are nominal values to be used as a guide. Operator may change sensitivities as required.

3. In some steps the DSKY operations and displays required when the LOC contains Program Aurora 86 (3021101-031 or -031)

#### INITIALIZATION

- Deleted.
- Insure that the COC/LOC POWER ON and the 400 CPS POWER ON pushbuttons are lit.

VERIFICATION WITH SIDL REQUIRED BEFORE USE

DATE 15 MAR 66

FOR DATA  
Ch. 1-1-1-1

3. If STBY condition lamp on DSKY is lighted, press and hold PRO (or STBY) pushbutton until lamp goes out. If lamp does not go out within 5 seconds, release and press pushbutton again. If PRO (or STBY) pushbutton is pressed more than once, record in system log the number of times pressed. Press ALARM RESET pushbutton on Programmer and Monitor panel of CTS.

4. Insure that the PROCEED lamp on the PROCEED/ISS OPERATE pushbutton is lit.

5. Insure that the PSA HTR. FWR lamp on the Temperature Monitor panel is lighted.

6. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 175. Adjust the G & N POWER ADJUST until the DVM indicates 28.0 (+0.5) vdc. Record indication.

#### IMU TIME DELAY

- Deleted.
- Deleted.
- Deleted.
- Deleted.

11. Set switches and controls on the Counter as follows:

DISPLAY RESET to ZERO

CLOCK FREQUENCY DIVIDER to 10<sup>4</sup>

CLOCK SELECTOR to INT

INPUT SELECTOR to C SENSE

SENSE SELECTOR to FWD

FUNCTION to COUNT

12. Simultaneously press the RESET pushbutton on the Counter and the PROCEED/ISS OPERATE pushbutton on the Test Control panel.

13. Perform the following DSKY operations:

a. VERB 11 NOUN 10 ENTR

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the following signals:

- Acos Temperature on CHANNEL 3-3.
  - IRIG Temperature on CHANNEL 4-3.
  - IMU Heater Discrete on CHANNEL 5-15.
  - IMU Blower Discrete on CHANNEL 6-15.
20. Insure that CH 3 DC, CH 4 DC, CH 5 DC and CH 6 AC pushbuttons on the Oscilloscope Signal Selector panel are lighted.

21. Connect a jumper from TPA #2 TB4-21 (M) and TPA #2 TB5-23 (O) to TPA #2 DIRECT PROBES #9 (M) and J10 (O) respectively.

22. Connect a jumper from PROBES OUTPUT, DIRECT to CH 5, IN-DC on the Auxiliary Input Panel.

23. Connect jumpers from TPA #2 TB4-20 (M) and TPA #2 TB5-23 (O) to CH 6, IN-AC on the Auxiliary Input Panel.

24. Zero and calibrate CHANNELS 3, 4, and 5 on the Oscilloscope Amplifier. Calibrate CHANNEL 6 after entering the OPERATE mode.

25. Mark the Oscilloscope Channels as follows:

- CHANNEL 3 "start of PIPA TEMP stability test"
- CHANNEL 4 "start of IRIG TEMP stability test"
- CHANNEL 5 "start of IMU Heater Discrete"
- CHANNEL 6 "start of IMU Blower Discrete"

31. Press the EVENT MARKER on the Oscilloscope Control Panel immediately after step 30 and record the time.

32. Verify and record by observing the PIPA Monitor Scope that no PIPA torquing is present until after the DSKY display changes from 00030 to 40000 to 00000.

33. Press the EVENT MARKER on the Oscilloscope Control panel immediately after the DSKY display changes from 00030 to 40000 to 00000.

34. After the DSKY display changes from 00030 to 40000 to 00000 perform the following DSKY operations:

- VERB 16 NOUN 20 ENTR
- Record the OG, MG, and IG positions as indicated on the Gimbal Position Control panel and as indicated on the DSKY displays.

All axes shall indicate approximately 000.00°.

36. Perform the following DSKY operations:

- VERB 41 NOUN 20 ENTR
- +00000
- +00000
- +00000

Set the PAVM FUNCTION selector to total and measure the following signals on the highest usable sensitivity of the meters.

Record the indications:

Signal

CROSSBAR CONTROL

a. Cos AOG IX 241

b. Cos AMG IX 242

c. Cos AIG IX 243

d. Sin AOG IX 142

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- 8in AMG IX 143
- 8in AIG IX 144

37. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 175. Adjust the G & N POWER ADJUST until the DVM indicates 28.00 (+0.25) VDC.

#### STANDBY TO OPERATE TEMPERATURE TRANSIENT

38. 15 minutes after performing step 31, press the EVENT MARKER on the Oscilloscope Control panel and record the time.

Immediately set the CROSSBAR CONTROL to 255 and monitor and record the PIPA temperature deviation as indicated on the DVM.

39. 30 minutes after performing step 31 press the EVENT MARKER on the Oscilloscope Control panel and record the time.

Change the CHANNEL 4 Range to the smallest usable scale. Immediately set the CROSSBAR CONTROL to 156 and monitor and record the IRIG temperature deviation as indicated on the DVM.

#### 800 CPS P/S THERMISTOR

40. Insert a 10 K resistor in series with the Wheatstone bridge. Measure and record 800 cps P/S Temperature thermistor resistance across pins TB5-12 and TB6-13 on TPA #2.

#### TEMP MON 1 THERMISTOR

41. Measure and record the Temp Mon 1 thermistor resistance across pins TB5-14 and TB6-15 of TPA #2.

PIPA CAL. MOD. THERMISTOR

42. Measure and record PIPA Cal. Mod.

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thermistor resistance across TBI-31 and TBI-27 on TPA 42.

IMU CAGE

43. Perform the following DSKY operations:

- VERB 41 NOUN 20 ENTR
- Observe:  
VERB 21 NOUN 23 Flashing  
ENTR
- +00500
- Observe:  
VERB 23 NOUN 23 Flashing  
ENTR
- +00500
- Observe:  
VERB 23 NOUN 23 Flashing  
ENTR
- +00500
- VERB 16 NOUN 20 ENTR

44. When the DSKY registers display (approx):

Row 1 +00500  
Row 2 +00500  
Row 3 +00500

press and hold the IMU CAGE COMMAND pushbutton on the Test Control panel. Perform the following DSKY operation:

VERB 36 ENTR  
NOTE: Disregard ISS WARNING light on Monitor Panel.  
The ISS WARNING light will extinguish in step 46.

45. Set the PAVM FUNCTION selector to total and measure the following signals on the highest usable sensitivity of the meters.

Record the indications:

Signal CROSSBAR CONTROL

- 8in AOG 1X 143
- 8in AMG 1X 143
- 8in AIG 1X 144

46. Release the IMU CAGE COMMAND pushbutton on the Test Control Panel and perform the following DSKY operations:

VERB 11 NOUN 10 ENTR  
00012 ENTR  
47. Record the display of Row 1.  
INERTIAL TEMPERATURE CONTROL POINT

48. Allow the PIPA and IRIG temperatures to stabilize as indicated by a voltage change of 0.05 volt or less over a one hour period as monitored on the Oscilloscope. Stabilization should occur within 2 hours after performance of step 31. Set CROSSBAR CONTROL to 255 and monitor and record the PIPA temperature deviation as indicated on the DVM. Set the CROSSBAR CONTROL to 156 and monitor and record the IRIG temperature deviation as indicated on the DVM. Stop the Oscilloscope.

49. Compare the PIPA STANDBY temperature deviation from step 28 with the PIPA temperature recorded in step 46. Calculate and record the difference.

50. Compare the PIPA temperature recorded in step 28 with the PIPA temperature recorded in step 46. Calculate and record the difference.

51. Compare the IRIG temperature recorded in step 28 with the IRIG temperature

recorded in step 46. Calculate and record the difference.

HEATER TELEMETRY DISCRETE

52. Record the maximum and minimum voltage indicated on CHANNEL 5.

BLOWER TELEMETRY DISCRETE

53. Record the minimum and/or maximum voltage indicated on CHANNEL 6 or both if the blower is cycling.

NORMALIZATION

54. Upon completion of the data sheets, make a copy of the data sheets and forward one set immediately to:

IMU Thermo Design Group  
MS 99  
Instrumentation Laboratory  
75 Cambridge Parkway  
Cambridge, Massachusetts 02143

55. Perform the following DSKY operations:

- VERB 36 ENTR
- VERB 41 NOUN 20 ENTR
- Observe:  
VERB 21 NOUN 23 Flashing  
ENTR
- +00000
- Observe:  
VERB 23 NOUN 23 Flashing  
ENTR
- +00000
- Observe:  
VERB 23 NOUN 23 Flashing  
ENTR
- +00000
- VERB 16 NOUN 20 ENTR

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ASSEMBLY UNDER TEST		TEST HISTORY	
TITLE	DATE	START TIME	END TIME
SER. NO.	DWG	REV.	SITE / LOCATION
TOTAL ELAPSED			
MAJOR GROUND SUPPORT EQUIPMENT			
NAME	SER. NO.	SER. NO.	CAL DATE
NAME	SER. NO.	SER. NO.	CAL DATE
CONDUCTED BY		APPROVED BY	
NAME/AFFILIATION		NAME/AFFILIATION	
JDC ITEM NO.	PARAMETER	UNITS	RECORDED VALUES
			1st 2nd* 3rd*
6	DVM voltage	volts	27.50
15	Elapsed time	sec	85
18	Time	hr min	
28	PIPA Temperature Deviation (Standby)	VDC	
29	IRIG Temperature Deviation (Standby)	VDC	
31	Time	hr min	
32	PIPA torquing not present until after Display change		
35	OG Gimbal position		
	MG Gimbal position		
	IG Gimbal position		
	OG DSKY position (Row 1)		

\* TO BE USED AS REQUIRED OR DESIRED

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PARAMETER		UNITS	MIN VALUE	RECORDED VALUES	MAX VALUE	REJ/ACC
JDC ITEM NO.				1st 2nd* 3rd*		
35	MG DSKY position (Row 3)					
	IG DSKY position (Row 2)					
36	Cos AOG 1X	vrms	23.4		28.6	
	Cos AMG 1X	vrms	23.4		28.6	
	Cos AIG 1X	vrms	23.4		28.6	
	Sin AOG 1X	vrms	0.00		0.50	
	Sin AMG 1X	vrms	0.00		0.50	
	Sin AIG 1X	vrms	0.00		0.50	
38	Time	n/a				
	PIPA Temperature Deviation (Operate 15 min)	VDC				
39	Time	n/a				
	IRIG Temperature Deviation (Operate 30 min)	VDC				
40	800 CPS/P8 temperature	ohms	12210		18,370	
41	Temp Mon 1	ohms	11400		23,250	
42	PIPA Cal. Mod.	ohms	13650		23,250	
45	Sin AOG 1X	vrms	0.00		0.50	
	Sin AMG 1X	vrms	0.00		0.50	
	Sin AIG 1X	vrms	0.00		0.50	
47	Row 1 display		xxxxx (xxx3x)		xxxxx (xxx3x)	

\* To be used as required or desired  
\*\* MIN and MAX VALUES shown in parentheses apply to Program Aurora 88

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FORM 000-9  
Chg. 1-23-5

APOLLO G & N  
EQUIPMENT TEST  
DATA SHEET 3 OF 3

JOB OPERATE CONTROL TEST

JDC  
NO. 12816  
REV. 1

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES			MAX VALUE	REJ A/C
				1st	2nd*	3rd*		
48	PIPA Temperature Deviation (Operate stabilized)	VDC	-0.5				+1.0	
	IRIG Temperature Deviation (Operate stabilized)	VDC	-1.25				+1.25	
49	Step 28 - Step 48	VDC					0.50	
50	Step 38 - Step 48	VDC					0.25	
51	Step 39 - Step 48	VDC					0.25	
52	Maximum (OFF state) CHANNEL 5 Voltage	VDC	19.5				33.5	
	Minimum (ON state) CHANNEL 5 Voltage	VDC	-5.0				+5.0	
53	Maximum (OFF state) CHANNEL 6 Voltage	Vrms	25.2				30.5	
	Minimum (ON state) CHANNEL 6 Voltage	Vrms	-5.0				+5.0	

\* TO BE USED AS REQUIRED OR DESIRED

DATE 15 MAR 68

FORM 6151  
Aug. 1-3-65

SUBSYSTEM LEM G & N SYSTEM				APPROVAL			
Rev	Date	NO	JDC	MIT	NASA	DATE	REVISIONS
A	8-7-66	28401	ALL	MM	ACM		
B	7-5-66	30045	1,2,3	MM	WSJ		
C	8-10-66	30550	ALL	EA	WSJ		
D	10-13-66	31512	1,2	EA	WSJ		
E	11-10-66	31902	3,4,5	EA	WSJ		
F	1-18-67	32687	6	EA	WSJ		
G	3-30-67	33468	1	EA	WSJ		
H	8-10-67	34337	1,3,4,5	EA	WSJ		
J	8-31-67	34456	1,2	EA	WSJ		
K	3-28-68	35979	ALL	EA	WSJ		
L	4-2-68	36043	ALL	EA	WSJ		
M	7-15-68	36548	ALL	EA	WSJ		

DESCRIPTION: Provide Operate Control Test for IMU Time Delay, Gimbal Ambiguity, IX Sin and Cos Signals, Standby to Operate Temperature Transient, 800 CPS P/S Thermistor, Temp. Mon. 1 Thermistor, PIPA Cal. Mod. Thermistor, Auto Cage, Inertial Temperature Control Point, Heater Telemetry Discrete, Blower Telemetry Discrete and Normalization.

IMPORTANT: 1. Insure that cable W226 is removed and connector assembly (2003089) is connected to LGC test connector before proceeding with this JDC.

2. Insure that the G & N system has been in the STANDBY mode with LGC power ON for a minimum of 2 hours before proceeding with Step 12.

3. Oscilloscope sensitivities given in this JDC are nominal values to be used as a guide. Operator may change sensitivities as required.

4. In some steps the DSKY operations and displays are lit.

VERIFICATION WITH SIDL REQUIRED BEFORE USE

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FORM 00113A  
Chg. 1-1 -1-6

13. Perform the following DSKY operations:  
a. VERB 11 NOUN 10 ENTR  
b. 00012 ENTR  
c. Observe: 0 displayed in Row 1

14. Set the FUNCTION selector on the Counter to OFF immediately after the DSKY display changes from 0 to 4.

15. Record the time displayed on the Counter.

16. Perform the following DSKY operations:  
a. VERB 41 NOUN 20 ENTR  
b. Observe: VERB 21 NOUN 22 Flashing  
c. +09000 ENTR  
d. Observe: VERB 22 NOUN 22 Flashing  
e. +09000 ENTR  
f. Observe: VERB 23 NOUN 22 Flashing  
g. +09000 ENTR  
h. VERB 16 NOUN 20 ENTR

NOTE: If LGC contains Aurora 85 test ropes, NO ATT lamp on DSKY will not light in step 17.

17. When the DSKY registers display:  
Row 1 +09000 ±00500  
Row 2 +09000 ±00500  
Row 3 +09000 ±00500  
Press the PROCEED/ISS STANDBY pushbutton on the Test Control panel. The ISS STANDBY portion shall remain lighted and

18. Record the time that the ISS was placed in the STANDBY mode.

19. Set CHANNELS 3, 4, 5, and 6 of the Oscilloscope Signal Selector panel to monitor the following signals:  
a. Accel. Temperature on CHANNEL 3-3.  
b. IRIG Temperature on CHANNEL 4-2.  
c. IMU Heater Discrete on CHANNEL 5-15.  
d. IMU Blower Discrete on CHANNEL 6-18.

20. Insure that CH 3 DC, CH 4 DC, CH 5 DC and CH 6 AC pushbuttons on the Oscilloscope Signal Selector panel are lighted.

21. Connect a jumper from TPA #2 TB4-21 (M) and TPA #2 TB5-22 (M) to TPA #2 DIRECT PROBES J9 (M) and J10 (M) respectively.

22. Connect a jumper from PROBES OUTPUT, DIRECT to CH 6, IN-DC on the Auxiliary Input Panel.

23. Connect jumpers from TPA #3 TB4-20 (M) and TPA #3 TB5-23 (M) to CH 6, IN-AC on the Auxiliary Input Panel.

24. Zero and calibrate CHANNELS 3, 4, and 5 on the Oscilloscope Amplifier. Calibrate CHANNEL 6 after entering the OPERATE mode.

25. Mark the Oscilloscope Channels as follows:  
a. CHANNEL 3 "start of PIPA TEMP stability test"

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the PROCEED/ISS OPERATE pushbutton shall go out. GIMBAL LOCK and NO ATT lamps on DSKY will light.

18. Record the time that the ISS was placed in the STANDBY mode.

19. Set CHANNELS 3, 4, 5, and 6 of the Oscilloscope Signal Selector panel to monitor the following signals:  
a. Accel. Temperature on CHANNEL 3-3.  
b. IRIG Temperature on CHANNEL 4-2.  
c. IMU Heater Discrete on CHANNEL 5-15.  
d. IMU Blower Discrete on CHANNEL 6-18.

20. Insure that CH 3 DC, CH 4 DC, CH 5 DC and CH 6 AC pushbuttons on the Oscilloscope Signal Selector panel are lighted.

21. Connect a jumper from TPA #2 TB4-21 (M) and TPA #2 TB5-22 (M) to TPA #2 DIRECT PROBES J9 (M) and J10 (M) respectively.

22. Connect a jumper from PROBES OUTPUT, DIRECT to CH 6, IN-DC on the Auxiliary Input Panel.

23. Connect jumpers from TPA #3 TB4-20 (M) and TPA #3 TB5-23 (M) to CH 6, IN-AC on the Auxiliary Input Panel.

24. Zero and calibrate CHANNELS 3, 4, and 5 on the Oscilloscope Amplifier. Calibrate CHANNEL 6 after entering the OPERATE mode.

25. Mark the Oscilloscope Channels as follows:  
a. CHANNEL 3 "start of PIPA TEMP stability test"

b. CHANNEL 4 "start of IRIG TEMP stability test"

c. CHANNEL 5 "start of IMU Heater Discrete"

d. CHANNEL 6 "start of IMU Blower Discrete"

26. Set the CHART SPEEDS to 1 and RANGE to .2 V/CM on the Oscilloscope Control for CHANNEL 3, 2 V/CM for CHANNEL 4 and 20 V/CM for CHANNELS 5 and 6. Start the Oscilloscope by setting the CHART DRIVE switch to MM/SEC.

NOTE: Read and understand steps 27 through 48 noting that steps 38 and 39 shall be performed 15 and 30 minutes after step 31. Steps 31 and 48 take precedence over steps 27 through 48.

TURN-ON CAGE TEST AND CDU AMBIGUITY TEST

27. Perform the following DSKY operations:  
a. VERB 11 NOUN 10 ENTR  
b. 00012 ENTR

27A. Allow the PIPA temperature to stabilize as indicated by a voltage change of 0.05 volt or less over a 30 minute period on CHANNEL 3.

28. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 255, and

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monitor and record the PIPA temperature deviation as indicated on the DVM.

29. Set the CROSSBAR CONTROL to 156 and monitor and record the IRIG temperature deviation as indicated on the DVM.

30. Press the PROCEED/ISS OPERATE pushbutton on the Test Control panel.

31. Press the EVENT MARKER on the Oscilloscope Control Panel immediately after step 30 and record the time.

32. Verify and record by observing the PIPA Monitor Scope that no PIPA torque is present until after the DSKY display changes from 00030 to 40000 to 00000.

33. Press the EVENT MARKER on the Oscilloscope Control panel immediately after the DSKY display changes from 00030 to 40000 to 00000.

34. After the DSKY display changes from 00030 to 40000 to 00000 perform the following DSKY operation:  
a. VERB 16 NOUN 20 ENTR

35. Record the OG, MG, and IG positions as indicated on the Gimbal Position Control panel and as indicated on the DSKY displays. All axes shall indicate approximately 000.00°.

36. Perform the following DSKY operations:  
a. VERB 41 NOUN 20 ENTR  
b. Observe: VERB 21 NOUN 22 Flashing  
c. +00000 ENTR

37. 15 minutes after performing step 31, press the EVENT MARKER on the Oscilloscope Control panel and record the time. Immediately set the CROSSBAR CONTROL to 255 and monitor and record the PIPA temperature deviation as indicated on the DVM.

38. 30 minutes after performing step 31, press the EVENT MARKER on the Oscilloscope Control panel and record the time. Change the CHANNEL 4 Range to the smallest

Observe:  
VERB 22 NOUN 22 Flashing  
e. +00000 ENTR  
f. Observe: VERB 23 NOUN 22 Flashing  
g. +00000 ENTR

Set the PAVM FUNCTION selector to total and measure the following signals on the highest usable sensitivity of the meters.  
Record the indications:  
Signal  
CROSSBAR CONTROL  
a. Cos AOG IX 241  
b. Cos AMG IX 242  
c. Cos AIG IX 243  
d. Sin AOG IX 142  
e. Sin AMG IX 143  
f. Sin AIG IX 144

37. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 173. Adjust the G & N POWER ADJUST until the DVM indicates 28.00 (±0.25) VDC.  
STANDBY TO OPERATE TEMPERATURE TRANSIENT

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JOB OPERATE CONTROL TEST		JDC 12616 REV M PAGE 5 OF 6
SUBSYSTEM LEM G & N SYSTEM		ASSY
usable scale. Immediately set the CROSSBAR CONTROL to 156 and monitor and record the IRIG temperature deviation as indicated on the DVM.		
800 CPS P/S THERMISTOR 40. Insert a 10 K resistor in series with the Wheatstone bridge. Measure and record 800 cps P/S Temperature thermistor resistance across pins TB5-12 and TB5-13 on TPA #2.		
TEMP MON 1 THERMISTOR 41. Measure and record the Temp Mon 1 thermistor resistance across pins TB5-14 and TB5-15 of TPA #2.		
PIPA CAL. MOD. THERMISTOR 42. Measure and record PIPA Cal. Mod. thermistor resistance across TB1-31 and TB1-27 on TPA #2.		
43. Perform the following DSKY operations: a. VERB 41 NOUN 20 ENTR b. Observe: VERB 31 NOUN 23 Flashing ENTR c. +00500 d. Observe: VERB 23 NOUN 23 Flashing ENTR e. +00500 f. Observe: VERB 23 NOUN 22 Flashing ENTR g. +00500 h. VERB 16 NOUN 20 ENTR 44. When the DSKY registers display (approx): Row 1 +00500		
45. Set the PAVM FUNCTION selector to total and measure the following signals on the highest usable sensitivity of the meters. Record the indications: Signal CROSSBAR CONTROL a. Sin AOG IX 142 b. Sin AMG IX 143 c. Sin AIG IX 144 46. Release the IMU CAGE COMMAND pushbutton on the Test Control Panel and perform the following DSKY operations: VERB 11 NOUN 10 ENTR 00012 ENTR 47. Record the display of Row 1. INERTIAL TEMPERATURE CONTROL POINT 48. Allow the PIPA and IRIG temperatures to stabilize as indicated by a voltage change of 0.05 volt or less over a 30 minute period as monitored on the Oscillograph. Stabilization should occur within 2 hours after performance of step 31. Set CROSSBAR CONTROL to 156.		

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JOB OPERATE CONTROL TEST		JDC 12616 REV M PAGE 6 OF 6
SUBSYSTEM LEM G & N SYSTEM		ASSY
to 255 and monitor and record the PIPA temperature deviation as indicated on the DVM. Set the CROSSBAR CONTROL to 156 and monitor and record the IRIG temperature deviation as indicated on the DVM. Stop the Oscillograph.		
49. Compare the PIPA STANDBY temperature deviation from step 28 with the PIPA temperature recorded in step 48. Calculate and record the difference. 50. Compare the PIPA temperature recorded in step 38 with the PIPA temperature recorded in step 48. Calculate and record the difference. 51. Compare the IRIG temperature recorded in step 39 with the IRIG temperature recorded in step 48. Calculate and record the difference. HEATER TELEMETRY DISCRETE 52. Record the maximum and minimum voltage indicated on CHANNEL 5. BLOWER TELEMETRY DISCRETE 53. Record the minimum and/or maximum voltage indicated on CHANNEL 6 or both if the blower is cycling. NORMALIZATION 54. Upon completion of the data sheets, make a copy of the data sheets and forward one set immediately to: IMU Thermo Design Group MS 99 Instrumentation Laboratory 76 Cambridge Parkway Cambridge, Massachusetts 02142		
55. Perform the following DSKY operations: a. VERB 36 ENTR b. VERB 41 NOUN 20 ENTR c. Observe: VERB 21 NOUN 23 Flashing ENTR d. +00000 e. Observe: VERB 22 NOUN 22 Flashing ENTR f. +00600 g. Observe: VERB 23 NOUN 22 Flashing ENTR h. +00000 i. VERB 16 NOUN 20 ENTR 56. Observe the DSKY indicates the following: a. Row 1 indicates +00000 (+00100) b. Row 2 indicates +00000 (+00100) c. Row 3 indicates +00000 (+00100). 57. Enter VERB 36 into DSKY and press ENTR pushbutton.		

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APOLLO G & N EQUIPMENT TEST DATA SHEET 1 OF 3		JDC 12616C REV M INITIAL TORR 271M				
JOB OPERATE CONTROL TEST						
ASSEMBLY UNDER TEST TITLE _____ DATE _____ START _____ END _____ SITE / LOCATION _____ SER. NO. _____ DWG _____ REV _____ TIME _____ START _____ END _____ TOTAL ELAPSED _____						
MAJOR GROUND SUPPORT EQUIPMENT NAME _____ SER. NO. _____ CAL DATE _____ NAME _____ SER. NO. _____ CAL DATE _____						
CONDUCTED BY _____ NAME/AFFILIATION _____ APPROVED BY _____ NAME/AFFILIATION _____						
JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES	MAX VALUE	REJ ACC
6	DVM voltage	volts	27.50	1st	2nd*	3rd*
15	Elapsed time	sec	85			
16	Time	hr				
28	PIPA Temperature Deviation (Standby)	VDC				
29	IRIG Temperature Deviation (Standby)	VDC				
31	Time	hr				
33	PIPA torquing not present until after Display change	min				
35	OG Gimbal position					
	MG Gimbal position					
	IG Gimbal position					
	OG DSKY position (Row 1)					

\* TO BE USED AS REQUIRED OR DESIRED

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APOLLO G & N EQUIPMENT TEST DATA SHEET 2 OF 3

JOB OPERATE CONTROL TEST		JDC 12616C REV M				
JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES	MAX VALUE	REJ ACC
35	MG DSKY position (Row 3)					
	IG DSKY position (Row 2)					
36	Cos AOG IX	vrms	23.4		28.6	
	Cos AMG IX	vrms	23.4		28.6	
	Cos AIG IX	vrms	23.4		28.6	
	Sin AOG IX	vrms	0.00		0.50	
	Sin AMG IX	vrms	0.00		0.50	
	Sin AIG IX	vrms	0.00		0.50	
38	Time	min				
	PIPA Temperature Deviation (Operate 15 min)	VDC				
39	Time	min				
	IRIG Temperature Deviation (Operate 30 min)	VDC				
40	800 CPS/PS temperature	ohms	12210		18,370	
41	Temp Mon 1	ohms	11400		23,250	
42	PIPA Cal. Mod.	ohms	13650		23,250	
45	Sin AOG IX	vrms	0.00		0.50	
	Sin AMG IX	vrms	0.00		0.50	
	Sin AIG IX	vrms	0.00		0.50	
47	Row 1 display		XXXXX *** (xxx3x)		XXXXX *** (xxx3x)	

\* To be used as required or desired  
 \*\* MIN and MAX VALUES shown in parentheses apply to Program Aurora 88

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APOLLO 6 & N  
EQUIPMENT TEST  
DATA SHEET OF 3

JOB OPERATE CONTROL TEST

JDC  
NO. 12616  
REV. M

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES			MAX VALUE	REJ ACC
				1st	2nd*	3rd*		
48	PIPA Temperature Deviation (Operate stabilized)	VDC	-0.5				+1.0	
	IRIG Temperature Deviation (Operate stabilized)	VDC	-1.25				+1.25	
49	Step 28 - Step 48	VDC					0.50	
50	Step 38 - Step 48	VDC					0.25	
51	Step 39 - Step 48	VDC					0.25	
52	Maximum (OFF state) CHANNEL 5 Voltage	VDC	19.5				33.5	
	Minimum (ON state) CHANNEL 5 Voltage	VDC	-5.0				+5.0	
53	Maximum (OFF state) CHANNEL 6 Voltage	Vrms	25.2				30.8	
	Minimum (ON state) CHANNEL 6 Voltage	Vrms	-5.0				+5.0	

\* TO BE USED AS REQUIRED OR DESIRED

DATE 15 MAR 56

FORM 10150  
CUG. 1-5-55

SUBSYSTEM LEM G & N SYSTEM

DESCRIPTION Provide Operate Control Test for IMU Time Delay, Gimbal Ambiguity, 1X Sin and Cos Signals, Standby to Operate Temperature Transient, 800 CPS P/S Thermistor, Temp. Mon. 1 Thermistor, PIPA Cal. Mod. Thermistor, Auto CAGE, Inertial Temperature Control Point, Heater Telemetry Discrete, Blower Telemetry Discrete and Normalization.

Rev.	Date	TDRR NO.	PAGES REVISED	APPROVAL	REFERENCES
1	6-7-66	29401	ALL	MIT NASA	PS-6015000
2	7-5-66	30045	1, 2, 3	MM	ACM
3	8-10-66	30550	ALL	EA	WS
4	10-13-66	31512	1, 2	EA	WS
5	11-10-66	31902	3, 4, 5	EA	WS
6	1-18-67	32667	6	EA	WS
7	3-30-67	33468	1	EA	WS
8	8-10-67	34337	1, 3, 4, 5	EA	WS
9	8-31-67	34456	1, 2	EA	WS
10	3-28-68	35979	ALL	EA	WS
11	4-9-68	36043	1	EA	WS
12	7-15-68	36548	ALL	EA	WS
13	5-26-70	38138	1, 2, 7	EA	WS

IMPORTANT: 1. Insure that cable W226 is removed and connector assembly (2003089) or Restart Monitor module (2998989) is connected to LGC test connector before proceeding with this JDC.

2. Insure that the G & N system has been in the STANDBY mode with LGC power ON for a minimum of 2 hours before proceeding with Step 12.

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FIGURE 10117  
CH 1, P. 1-1

SUBSYSTEM LEM G & N SYSTEM

ASSY

Program Aurora 85 (2021101-011). These differences are noted within the procedure.

5. If the VERB display on the DSKY contains a number from 11 to 17, the KEY REL indicator may flash when DSKY entries are made.

INITIALIZATION

1. Deleted.

2. Insure that the CCG/LGC POWER ON and the 400 CPS POWER ON pushbuttons are lit.

3. If STBY condition lamp on DSKY is lighted, press and hold PRO (or STBY) pushbutton until lamp goes out. If lamp does not go out within 5 seconds, release and press pushbutton again. If PRO (or STBY) pushbutton is pressed more than once, record in system log the number of times pressed.

Press ALARM RESET pushbutton on Programmer and Monitor panel of CTS.

4. Insure that the PROCEED lamp on the PROCEED/ISS OPERATE pushbutton is lit.

5. Insure that the PSA HTR. PWR lamp on the Temperature Monitor panel is lighted.

6. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 175. Adjust the G & N POWER ADJUST until the DVM indicates 28.0 (±0.5) vdc. Record indication.

NOTE: Step 7 applies only when Restart Monitor module (2998989) is installed.

7. Perform the following DSKY operations:

a. VERB 21 NOUN 10 ENTR

NOTE: Step 7 applies only when Restart Monitor module (2998989) is installed.

16. Perform the following DSKY operations:

a. VERB 41 NOUN 20 ENTR

b. Observe:

0 ----- displayed in Row 1

14. Set the FUNCTION selector on the Counter to OFF immediately after the DSKY display changes from 0 ----- to 4 -----.

15. Record the time displayed on the Counter.

16. Perform the following DSKY operations:

a. VERB 41 NOUN 20 ENTR

b. Observe:

VERB 21 NOUN 22 Flashing

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SUBSYSTEM LEM G & N SYSTEM

ASSY

21. Connect a jumper from TPA #2 TB4-21 (bl) and TPA #2 TB6-22 (lo) to TPA #2 DIRECT PROBES J9 (bl) and J10 (lo) respectively.

22. Connect a jumper from PROBES OUTPUT, DIRECT to CH 5, IN-DC on the Auxiliary Input Panel.

23. Connect jumpers from TPA #2 TB4-20 (bl) and TPA #2 TB6-33 (lo) to CH 6, IN-AC on the Auxiliary Input Panel.

24. Zero and calibrate CHANNELS 3, 4, and 5 on the Oscillograph Amplifier. Calibrate CHANNEL 6 after entering the OPERATE mode.

25. Mark the Oscillograph Channels as follows:

a. CHANNEL 3 "start of PIPA TEMP stability test"

b. CHANNEL 4 "start of IRIG TEMP stability test"

c. CHANNEL 5 "start of IMU Heater Discrete"

d. CHANNEL 6 "start of IMU Blower Discrete"

26. Set the CHART SPEEDS to 1 and RANGE to .2 V/CM on the Oscillograph Control for CHANNEL 3, 2 V/CM for CHANNEL 4 and 20 V/CM for CHANNELS 5 and 6. Start the Oscillograph by setting the CHART DRIVE switch to MM/SEC.

NOTE: Read and understand steps 27 through 48 noting that steps 38 and 39 shall be performed

17. When the DSKY registers display:

Row 1 +09000 ±00500

Row 2 +09000 ±00500

Row 3 +09000 ±00500

Press the PROCEED/ISS STANDBY pushbutton on the Test Control panel. The ISS STANDBY portion shall remain lighted and the PROCEED/ISS OPERATE pushbutton shall go out. GIMBAL LOCK and NO ATT lamps on DSKY will light.

18. Record the time that the ISS was placed in the STANDBY mode.

19. Set CHANNELS 3, 4, 5, and 6 of the Oscillograph Signal Selector panel to monitor the following signals:

a. Acel Temperature on CHANNEL 3-5.

b. IRIG Temperature on CHANNEL 4-5.

c. IMU Heater Discrete on CHANNEL 5-15.

d. IMU Blower Discrete on CHANNEL 6-15.

20. Insure that CH 3 DC, CH 4 DC, CH 5 DC and CH 6 AC pushbuttons on the Oscillograph Signal Selector panel are lighted.

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SUBSYSTEM LEM G & N SYSTEM

ASSY

34. After the DSKY display changes from 00030 to 40000 to 00000 perform the following DSKY operation:

a. VERB 16 NOUN 20 ENTR

35. Record the OG, MG, and IG positions as indicated on the Gimbal Position Control panel and as indicated on the DSKY display.

All axes shall indicate approximately 000.00°.

36. Perform the following DSKY operations:

a. VERB 41 NOUN 20 ENTR

b. Observe:

VERB 21 NOUN 22 Flashing

c. +00000 ENTR

d. Observe:

VERB 22 NOUN 22 Flashing

e. +00000 ENTR

f. Observe:

VERB 23 NOUN 22 Flashing

g. +00000 ENTR

Set the PAVM FUNCTION selector to total and measure the following signals on the highest usable sensitivity of the meters.

Record the indications:

Signal

CROSSBAR CONTROL

a. Cos AOG 1X 241

b. Cos AMG 1X 242

c. Cos AIG 1X 243

d. Sin AOG 1X 142

e. Sin AMG 1X 143

f. Sin AIG 1X 144

37. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 175. Adjust

to 40000 to 00000.

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SUBSYSTEM LEM G & N SYSTEM ASSY

the G & N POWER ADJUST until the DVM indicates 28.00 (+0.25) VDC.

STANDBY TO OPERATE TEMPERATURE TRANSIENT

38. 15 minutes after performing step 31, press the EVENT MARKER on the Oscillograph Control panel and record the time. Immediately set the CROSSBAR CONTROL to 255 and monitor and record the PIPA temperature deviation as indicated on the DVM.

39. 30 minutes after performing step 31 press the EVENT MARKER on the Oscillograph Control panel and record the time. Change the CHANNEL 4 Range to the smallest usable scale. Immediately set the CROSSBAR CONTROL to 156 and monitor and record the IRIG temperature deviation as indicated on the DVM.

800 CPS P/S THERMISTOR

40. Insert a 10 K resistor in series with the Wheatstone bridge. Measure and record 800 cps P/S Temperature thermistor resistance across plus TB5-12 and TB5-13 on TPA #2.

TEMP MON 1 THERMISTOR

41. Measure and record the Temp Mon 1 thermistor resistance across plus TB5-14 and TB5-15 of TPA #2.

PIPA CAL. MOD. THERMISTOR

42. Measure and record PIPA Cal. Mod. thermistor resistance across TBI-31 and TBI-27 on TPA #2.

IMU CAGE

43. Perform the following DSKY operations:

44. When the DSKY registers display (approx):

Row 1 +00500

Row 2 +00500

Row 3 +00500

press and hold the IMU CAGE COMMAND pushbutton on the Test Control panel. Perform the following DSKY operation:

VERB 36 ENTR

NOTE: Disregard ISS WARNING light on Monitor Panel. The ISS WARNING light will extinguish in step 46.

45. Set the PAYM FUNCTION selector to total and measure the following signals on the highest usable sensitivity of the meters.

Record the indications:

Signal

CROSSBAR CONTROL

a. Sin AOG 1X 142

b. Sin AMG 1X 143

c. Sin AIG 1X 144

46. Release the IMU CAGE COMMAND

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SUBSYSTEM LEM G & N SYSTEM ASSY

pushbutton on the Test Control Panel and perform the following DSKY operations:

VERB 11 NOUN 10 ENTR

00012

47. Record the display of Row 1.

INERTIAL TEMPERATURE CONTROL POINT

48. Allow the PIPA and IRIG temperatures to stabilize as indicated by a voltage change of 0.05 volt or less over a 30 minute period as monitored on the Oscillograph. Stabilization should occur within 3 hours after performance of step 31. Set CROSSBAR CONTROL to 255 and monitor and record the PIPA temperature deviation as indicated on the DVM. Set the CROSSBAR CONTROL to 156 and monitor and record the IRIG temperature deviation as indicated on the DVM. Stop the Oscillograph

49. Compare the PIPA STANDBY temperature deviation from step 28 with the PIPA temperature recorded in step 48. Calculate and record the difference.

50. Compare the PIPA temperature recorded in step 38 with the PIPA temperature recorded in step 48. Calculate and record the difference.

51. Compare the IRIG temperature recorded in step 39 with the IRIG temperature recorded in step 48. Calculate and record the difference.

HEATER TELEMETRY DISCRETE

52. Record the maximum and minimum voltage indicated on CHANNEL 5.

53. Record the minimum and/or maximum voltage indicated on CHANNEL 6 or both if the blower is cycling.

NORMALIZATION

54. Upon completion of the data sheets, make a copy of the data sheets and forward one set immediately to:

IMU Thermo Design Group

MS 99

Instrumentation Laboratory

75 Cambridge Parkway

Cambridge, Massachusetts 02142

55. Perform the following DSKY operations:

a. VERB 36 ENTR

b. VERB 41 NOUN 20 ENTR

c. Observe: VERB 21 NOUN 22 Flashing

d. +00000 ENTR

e. Observe: VERB 22 NOUN 22 Flashing

f. +00000 ENTR

g. Observe: VERB 23 NOUN 22 Flashing

h. +00000 ENTR

i. VERB 16 NOUN 20 ENTR

56. Observe the DSKY indicates the following:

a. Row 1 indicates +00000 (+00100)

b. Row 2 indicates +00000 (+00100)

c. Row 3 indicates +00000 (+00100).

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SUBSYSTEM LEM G & N SYSTEM ASSY

57. Enter VERB 36 into DSKY and press ENTR pushbutton.

NOTE: Step 58 applies only when Restart Monitor module (2898989) is installed.

58. Perform the following DSKY operations:

a. VERB 01 NOUN 10 ENTR

b. 00077 ENTR

c. The contents of Row 1 shall be 00000.

APOLLO GSN  
EQUIPMENT TEST  
DATA SHEET 1 OF 3

NO. 12616 DC  
REV. N  
INITIAL TDDR 27134

JOB OPERATE CONTROL TEST

ASSEMBLY UNDER TEST

TITLE \_\_\_\_\_ DATE \_\_\_\_\_ START \_\_\_\_\_ END \_\_\_\_\_ SITE / LOCATION \_\_\_\_\_

SER. NO. \_\_\_\_\_ DWG \_\_\_\_\_ REV \_\_\_\_\_ TIME \_\_\_\_\_ START \_\_\_\_\_ END \_\_\_\_\_ TOTAL ELAPSED \_\_\_\_\_

MAJOR GROUND SUPPORT EQUIPMENT

NAME \_\_\_\_\_ SER. NO. \_\_\_\_\_ CAL DATE \_\_\_\_\_

NAME \_\_\_\_\_ SER. NO. \_\_\_\_\_ CAL DATE \_\_\_\_\_

CONDUCTED BY \_\_\_\_\_ NAME/AFFILIATION \_\_\_\_\_ APPROVED BY \_\_\_\_\_ NAME/AFFILIATION \_\_\_\_\_

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES	MAX VALUE	REJ ACC
				1st	2nd*	3rd*
6	DVM voltage	volts	27.50			28.50
15	Elapsed time	sec	85			95
18	Time	hr				
		min				
28	PIPA Temperature	VDC				
	Deviation (Standby)					
29	IRIG Temperature	VDC				
	Deviation (Standby)					
31	Time	hr				
		min				
32	PIPA torquing not present until after Display change					
35	OG Gimbal position					
	MG Gimbal position					
	IG Gimbal position					
	OG DSKY position (Row 1)					

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\* TO BE USED AS REQUIRED OR DESIRED

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APOLLO G & N  
EQUIPMENT TEST  
DATA SHEET 2 OF 3

JDC  
NO. 12616  
REV. N

JOB OPERATE CONTROL TEST

JDC ITEM NO	PARAMETER	UNITS	RECORDED VALUES			MAX VALUE	REJ/ACC
			1st	2nd*	3rd*		
35 (cont)	MG DSKY position (Row 3)						
	IG DSKY position (Row 2)						
36	Cos AOG 1X	vrms	23.4			28.6	
	Cos AMG 1X	vrms	23.4			28.6	
	Cos AIG 1X	vrms	23.4			28.6	
	Sin AOG 1X	vrms	0.00			0.50	
	Sin AMG 1X	vrms	0.00			0.50	
	Sin AIG 1X	vrms	0.00			0.50	
38	Time	min					
	PIPA Temperature Deviation (Operate 15 min)	VDC					
39	Time	min					
	IRIG Temperature Deviation (Operate 30 min)	VDC					
40	800 CPS/PS temperature	ohms	12210			18,370	
41	Temp Mon 1	ohms	11400			23,250	
42	PIPA Cal. Mod.	ohms	13650			23,250	
45	Sin AOG 1X	vrms	0.00			0.50	
	Sin AMG 1X	vrms	0.00			0.50	
	Sin AIG 1X	vrms	0.00			0.50	
47	Row 1 display		xxxx (xxxx)			xxxx (xxxx)	

\* To be used as required or desired  
\*\* MIN and MAX VALUES shown in parentheses apply to  
Program Aurora 88

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APOLLO G & N  
EQUIPMENT TEST  
DATA SHEET 3 OF 3

JDC  
NO. 12616  
REV. N

JOB OPERATE CONTROL TEST

JDC ITEM NO	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES			MAX VALUE	REJ/ACC
				1st	2nd*	3rd*		
48	PIPA Temperature Deviation (Operate stabilized)	VDC	-0.5				+1.0	
	IRIG Temperature Deviation (Operate stabilized)	VDC	-1.25				+1.25	
49	Step 28 - Step 48	VDC					0.50	
50	Step 38 - Step 48	VDC					0.25	
51	Step 39 - Step 48	VDC					0.25	
52	Maximum (OFF state) CHANNEL 5 Voltage	VDC	19.5				33.5	
	Minimum (ON state) CHANNEL 5 Voltage	VDC	-5.0				+5.0	
53	Maximum (OFF state) CHANNEL 6 Voltage	vrms	25.2				30.8	
	Minimum (ON state) CHANNEL 6 Voltage	vrms	-5.0				+5.0	

\* TO BE USED AS REQUIRED OR DESIRED

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SUBSYSTEM LEM G & N SYSTEM

DESCRIPTION Provide Operate Control Test for IMU Time Delay, Gimbal Ambiguity, 1X Sin and Cos Signals, Standby to Operate Temperature Transient, 800 CPS P/S Thermistor, Temp. Mon. 1 Thermistor, PIPA Cal. Mod. Thermistor, Auto Cage, Inertial Temperature Control Point, Heater Telemetry Discrete, Blower Telemetry Discrete and Normalization.

Rev.	Let.	Date	TDRR	PAGES REVISED	APPROVAL	REFERENCES
				JDC	MIT	PS-4015000
A	6-7-66	29401	ALL	ALL	MM	ACM
B	7-5-66	30345	1,2,3	ALL	MM	7-1
C	8-10-66	30550	ALL	ALL	EA	WS
D	10-13-66	31512	1,2	-	EA	7
E	11-10-66	31902	3,4,5	-	EA	7
F	1-16-67	32667	6	1,2	EA	7
G	3-30-67	33468	1	2	EA	7
H	8-10-67	34337	1,3,4,5	1,2	EA	7
J	8-31-67	34436	-	1,2	EA	7
K	3-28-68	35979	ALL	2,3	EA	7
L	4-9-68	36043	1	-	EA	7
M	7-15-68	36548	ALL	3	EA	7
N	5-26-70	38138	1,2,7	-	EA	7
P	2-8-71	38337	-	3	EA	7

IMPORTANT: 1. Insure that cable W226 is removed and connector assembly (2003089) or Restart Monitor module (2889889) is connected to LGC test connector before proceeding with this JDC.

2. Insure that the G & N system has been in the STANDBY mode with LGC power ON for a minimum of 2 hours before proceeding with Step 12.
3. Oscillograph sensitivities given in this JDC are nominal values to be used as a guide. Operator may change sensitivities as required.
4. In some steps the DSKY operations and displays required when the LGC contains Program Aurora 88 (2021101-021 or -031) are different from the DSKY operations and displays required when the LGC contains

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FOR 4 001 3  
Chg. 3 1-6-64

SUBSYSTEM LEM G & N SYSTEM

Program Aurora 86 (2021101-011). These differences are noted within the procedure.  
5. If the VERB display on the DSKY contains a number from 11 to 17, the KEY REL indicator may flash when DSKY entries are made.

IMU TIME DELAY  
8. Deleted.  
9. Deleted.  
10. Deleted.  
11. Set switches and controls on the Counter as follows:

INITIALIZATION  
1. Deleted.  
2. Insure that the CGC/LGC POWER ON and the 400 CPS POWER ON pushbuttons are lit.  
3. If STBY condition lamp on DSKY is lighted, press and hold PRO (or STBY) pushbutton until lamp goes out. If lamp does not go out within 5 seconds, release and press pushbutton again. If PRO (or STBY) pushbutton is pressed more than once, record in system log the number of times pressed. Press ALARM RESET pushbutton on Programmer and Monitor panel of CTS.

4. Insure that the PROCEED lamp on the PROCEED/ISS OPERATE pushbutton is lit.  
5. Insure that the PSA HTR. PWR lamp on the Temperature Monitor panel is lighted.  
6. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 175. Adjust the G & N POWER ADJUST until the DVM indicates 28.0 (±0.5) vdc. Record indication.

NOTE: Step 7 applies only when Restart Monitor module (2889889) is installed.  
7. Perform the following DSKY operations:  
a. VERB 21 NOUN 10 ENTR

13. Perform the following DSKY operations:  
a. VERB 11 NOUN 10 ENTR  
b. 00012 ENTR  
c. Observe:  
0 ----- displayed in Row 1  
14. Set the FUNCTION selector on the Counter to OFF immediately after the DSKY display changes from 0 ----- to 4 -----.  
15. Record the time displayed on the Counter.

16. Perform the following DSKY operations:  
a. VERB 41 NOUN 20 ENTR  
b. Observe:  
VERB 21 NOUN 22 Flashing  
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SUBSYSTEM LEM G & N SYSTEM

c. +09000 ENTR  
d. Observe:  
VERB 22 NOUN 22 Flashing ENTR  
e. +09000 ENTR  
f. Observe:  
VERB 23 NOUN 22 Flashing ENTR  
g. +09000 ENTR  
h. VERB 16 NOUN 20 ENTR

NOTE: If LGC contains Aurora 85 test ropes, NO ATT lamp on DSKY will not light in step 17.  
17. When the DSKY registers display:  
Row 1 +09000 ±00500  
Row 2 +09000 ±00500  
Row 3 +09000 ±00500  
Press the PROCEED/ISS STANDBY pushbutton on the Test Control panel. The ISS STANDBY portion shall remain lighted and the PROCEED/ISS OPERATE pushbutton shall go out. GIMBAL LOCK and NO ATT lamps on DSKY will light.  
18. Record the time that the ISS was placed in the STANDBY mode.  
19. Set CHANNELS 3, 4, 5, and 6 of the Oscillograph Signal Selector panel to monitor the following signals:

- a. Accel Temperature on CHANNEL 3-3.
  - b. IRIG Temperature on CHANNEL 4-3.
  - c. IMU Heater Discrete on CHANNEL 5-15.
  - d. IMU Blower Discrete on CHANNEL 6-15.
20. Insure that CH 3 DC, CH 4 DC, CH 5 DC and CH 6 AC pushbuttons on the Oscillograph Signal Selector panel are lighted.

21. Connect a jumper from TPA #2 TB4-21 (H) and TPA #2 TB5-22 (H) to TPA #2 DIRECT PROBES J9 (H) and J10 (H) respectively.  
22. Connect a jumper from PROBES OUTPUT, DIRECT to CH 5, IN-DC on the Auxiliary Input Panel.  
23. Connect jumpers from TPA #2 TB4-20 (H) and TPA #2 TB5-33 (H) to CH 6, IN-AC on the Auxiliary Input Panel.  
24. Zero and calibrate CHANNELS 3, 4, and 5 on the Oscillograph Amplifier. Calibrate CHANNEL 6 after entering the OPERATE mode.  
25. Mark the Oscillograph Channels as follows:  
a. CHANNEL 3 "start of PIPA TEMP stability test"  
b. CHANNEL 4 "start of IRIG TEMP stability test"  
c. CHANNEL 5 "start of IMU Heater Discrete"  
d. CHANNEL 6 "start of IMU Blower Discrete"

26. Set the CHART SPEEDS to 1 and RANGE to .2 V/CM on the Oscillograph Control for CHANNEL 3, 2 V/CM for CHANNEL 4 and 20 V/CM for CHANNELS 5 and 6. Start the Oscillograph by setting the CHART DRIVE switch to MM/SEC.  
NOTE: Read and understand steps 27 through 48 noting that steps 38 and 39 shall be performed

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SUBSYSTEM LEM G & N SYSTEM

34. After the DSKY display changes from 00030 to 40000 to 00000 perform the following DSKY operation:  
a. VERB 16 NOUN 20 ENTR  
35. Record the OG, MG, and IG positions as indicated on the Gimbal Position Control panel and as indicated on the DSKY displays. All axes shall indicate approximately 000.00°.

36. Perform the following DSKY operations:  
a. VERB 41 NOUN 20 ENTR  
b. Observe:  
VERB 21 NOUN 22 Flashing ENTR  
c. +00000 ENTR  
d. Observe:  
VERB 22 NOUN 22 Flashing ENTR  
e. +00000 ENTR  
f. Observe:  
VERB 23 NOUN 22 Flashing ENTR  
Set the PAYM FUNCTION selector to total and measure the following signals on the highest usable sensitivity of the meters.  
Record the indications:  
Signal CROSSBAR CONTROL

a. Cos AOG 1X 241  
b. Cos AMG 1X 242  
c. Cos AIG 1X 243  
d. Sin AOG 1X 142  
e. Sin AMG 1X 143  
f. Sin AIG 1X 144  
37. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 173. Adjust to 40000 to 00000.

27. Perform the following DSKY operations:  
a. VERB 11 NOUN 10 ENTR  
b. 00012 ENTR  
27A. Allow the PIPA temperature to stabilize as indicated by a voltage change of 0.06 volt or less over a 30 minute period on CHANNEL 3.  
28. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 255, and monitor and record the PIPA temperature deviation as indicated on the DVM.  
29. Set the CROSSBAR CONTROL to 156 and monitor and record the IRIG temperature deviation as indicated on the DVM.  
30. Press the PROCEED/ISS OPERATE pushbutton on the Test Control panel.  
31. Press the EVENT MARKER on the Oscillograph Control Panel immediately after step 30 and record the time.  
32. Verify and record by observing the PIPA Monitor Scope that no PIPA torquing is present until after the DSKY display changes from 00030 to 40000 to 00000.  
33. Press the EVENT MARKER on the Oscillograph Control panel immediately after the DSKY display changes from 00030 to 40000 to 00000.

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SUBSYSTEM LEM G & N SYSTEM		ASSY
the G & N POWER ADJUST until the DVM indicates 28.00 (+0.25) VDC.		a. VERB 41 NOUN 20 ENTR
STANDBY TO OPERATE TEMPERATURE TRANSIENT		b. Observe: VERB 21 NOUN 22 Flashing ENTR
38. 15 minutes after performing step 31, press the EVENT MARKER on the Oscillograph Control panel and record the time.		c. +00500 ENTR
Immediately set the CROSSBAR CONTROL to 255 and monitor and record the PIPA temperature deviation as indicated on the DVM.		d. Observe: VERB 22 NOUN 22 Flashing ENTR
39. 30 minutes after performing step 31, press the EVENT MARKER on the Oscillograph Control panel and record the time.		e. +00500 ENTR
Change the CHANNEL 4 Range to the smallest usable scale. Immediately set the CROSSBAR CONTROL to 156 and monitor and record the IRIG temperature deviation as indicated on the DVM.		f. Observe: VERB 23 NOUN 22 Flashing ENTR
800 CPS P/S THERMISTOR		g. +00500 ENTR
40. Insert a 10 K resistor in series with the Wheatstone bridge. Measure and record 800 cps P/S Temperature thermistor resistance across pins TB5-12 and TB5-13 on TPA #2.		h. VERB 16 NOUN 20 ENTR
TEMP MON 1 THERMISTOR		44. When the DSKY registers display (approx): Row 1 +00500 Row 2 +00500 Row 3 +00500
41. Measure and record the Temp Mon 1 thermistor resistance across pins TB5-14 and TB5-15 of TPA #2.		press and hold the IMU CAGE COMMAND pushbutton on the Test Control panel. Perform the following DSKY operation: VERB 36 ENTR NOTE: Disregard ISS WARNING light on Monitor Panel. The ISS WARNING light will extinguish in step 46.
PIPA CAL. MOD. THERMISTOR		45. Set the PAVM FUNCTION selector to total and measure the following signals on the highest usable sensitivity of the meters. Record the indications: Signal CROSSBAR CONTROL a. Sin AOG 1X 142 b. Sin AMG 1X 143 c. Sin AIG 1X 144
42. Measure and record PIPA Cal. Mod. thermistor resistance across TBI-31 and TBI-27 on TPA #2.		46. Release the IMU CAGE COMMAND
IMU CAGE		
43. Perform the following DSKY operations:		

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JOB OPERATE CONTROL TEST		JDC 12616 REV P PAGE 6 OF 7
SUBSYSTEM LEM G & N SYSTEM		ASSY
pushbutton on the Test Control Panel and perform the following DSKY operations:		BLOWER TELEMETRY DISCRETE
VERB 11 NOUN 10 ENTR		53. Record the minimum and/or maximum voltage indicated on CHANNEL 6 or both if the blower is cycling.
00012 ENTR		NORMALIZATION
47. Record the display of Row 1.		54. Upon completion of the data sheets, make a copy of the data sheets and forward one set immediately to: IMU Thermo Design Group MS 99 Instrumentation Laboratory 75 Cambridge Parkway Cambridge, Massachusetts 02142
INERTIAL TEMPERATURE CONTROL POINT		55. Perform the following DSKY operations:
48. Allow the PIPA and IRIG temperatures to stabilize as indicated by a voltage change of 0.05 volt or less over a 30 minute period as monitored on the Oscillograph. Stabilization should occur within 2 hours after performance of step 31. Set CROSSBAR CONTROL to 255 and monitor and record the PIPA temperature deviation as indicated on the DVM.		a. VERB 36 ENTR
Set the CROSSBAR CONTROL to 156 and monitor and record the IRIG temperature deviation as indicated on the DVM. Stop the Oscillograph		b. VERB 41 NOUN 20 ENTR
49. Compare the PIPA STANDBY temperature deviation from step 28 with the PIPA temperature recorded in step 48. Calculate and record the difference.		c. Observe: VERB 21 NOUN 22 Flashing ENTR
50. Compare the PIPA temperature recorded in step 38 with the PIPA temperature recorded in step 48. Calculate and record the difference.		d. +00000
51. Compare the IRIG temperature recorded in step 39 with the IRIG temperature recorded in step 48. Calculate and record the difference.		e. Observe: VERB 22 NOUN 22 Flashing ENTR
HEATER TELEMETRY DISCRETE		f. +00000
52. Record the maximum and minimum voltage indicated on CHANNEL 5.		g. Observe: VERB 23 NOUN 22 Flashing ENTR
		h. +00000
		i. VERB 16 NOUN 20 ENTR
		56. Observe the DSKY indicates the following: a. Row 1 indicates +00000 (+00100) b. Row 2 indicates +00000 (+00100) c. Row 3 indicates +00000 (+00100).

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JOB OPERATE CONTROL TEST		JDC 12616 REV P PAGE 7 OF 7
SUBSYSTEM LEM G & N SYSTEM		ASSY
57. Enter VERB 36 into DSKY and press ENTR pushbutton.		
NOTE: Step 58 applies only when Restart Monitor module (2899989) is installed.		
58. Perform the following DSKY operations:		
a. VERB 01 NOUN 10 ENTR		
b. 00077 ENTR		
c. The contents of Row 1 shall be 00000.		

APOLLO GAN  
EQUIPMENT TEST  
DATA SHEET 1 OF 3

JOB OPERATE CONTROL TEST

NO. 12616DC  
REV. P  
INITIAL TDRR 27134

ASSEMBLY UNDER TEST		TEST HISTORY				
TITLE	DATE	START	END			
SER. NO.	DWG	REV	SITE / LOCATION			
MAJOR GROUND SUPPORT EQUIPMENT		START	END			
NAME		SER. NO.	CAL DATE			
NAME		SER. NO.	CAL DATE			
CONDUCTED BY		APPROVED BY				
NAME/AFFILIATION		NAME/AFFILIATION				
JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES	MAX VALUE	REJ ACC
				1st	2nd*	3rd*
6	DVM voltage	volts	27.50			28.50
15	Elapsed time	sec	85			95
18	Time	hr				
		min				
28	PIPA Temperature	VDC				
	Deviation (Standby)					
29	IRIG Temperature	VDC				
	Deviation (Standby)					
31	Time	hr				
		min				
32	PIPA torquing not present until after Display change					
35	OG Gimbal position					
	MG Gimbal position					
	IG Gimbal position					
	OG DSKY position (Row 1)					

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\* TO BE USED AS REQUIRED OR DESIRED

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APOLLO G & N  
EQUIPMENT TEST  
DATA SHEET 2 OF 3

JDC  
NO. 12816  
REV. P

JOB OPERATE CONTROL TEST

JDC ITEM NO	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES	MAX VALUE	REJ	ACC
				1st 2nd* 3rd*			
35	MG DSKY position (cont)						
	IG DSKY position (Row 2)						
36	Cos A <sub>OG</sub> 1X	vrms	23.4		28.6		
	Cos A <sub>MG</sub> 1X	vrms	23.4		28.6		
	Cos A <sub>IG</sub> 1X	vrms	23.4		28.6		
	Sin A <sub>OG</sub> 1X	vrms	0.00		0.50		
	Sin A <sub>MG</sub> 1X	vrms	0.00		0.50		
	Sin A <sub>IG</sub> 1X	vrms	0.00		0.50		
38	Time	min					
	PIPA Temperature Deviation (Operate 15 min)	VDC					
39	Time	min					
	IRIG Temperature Deviation (Operate 30 min)	VDC					
40	800 CPS/PS temperature	ohms	12210		18,370		
41	Temp Mon 1	ohms	11400		23,250		
42	PIPA Cal. Mod.	ohms	13650		23,250		
45	Sin A <sub>OG</sub> 1X	vrms	0.00		0.50		
	Sin A <sub>MG</sub> 1X	vrms	0.00		0.50		
	Sin A <sub>IG</sub> 1X	vrms	0.00		0.50		
47	Row 1 display		xxxxxx (xxxx3x)		xxxxxx (xxxx3x)		

\* To be used as required or desired  
\*\* MIN and MAX VALUES shown in parentheses apply to  
Program Aurora 88

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APOLLO G & N  
EQUIPMENT TEST  
DATA SHEET 3 OF 3

JDC  
NO. 12816  
REV. P

JOB OPERATE CONTROL TEST

JDC ITEM NO	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES	MAX VALUE	REJ	ACC
				1st 2nd* 3rd*			
48	PIPA Temperature Deviation (Operate stabilized)	VDC	-0.5		+1.0		
	IRIG Temperature Deviation (Operate stabilized)	VDC	-1.25		+1.25		
49	Step 28 - Step 48	VDC			0.50		
50	Step 38 - Step 48	VDC			0.25		
51	Step 39 - Step 48	VDC			0.35		
52	Maximum (OFF state) CHANNEL 5 Voltage	VDC	19.5		33.5		
	Minimum (ON state) CHANNEL 5 Voltage	VDC	-5.0		+5.0		
53	Maximum (OFF state) CHANNEL 6 Voltage	vrms	25.2		30.8		
	Minimum (ON state) CHANNEL 6 Voltage	vrms	-5.0		+5.0		

\* TO BE USED AS REQUIRED OR DESIRED

DATE 15 MAR 68









SUBSYSTEM				LEM G & N SYSTEM				ASSY			
<p><b>DESCRIPTION</b> The purpose of this test is to check gross G &amp; N System operation. Com inter-DSKY interface is checked by performing a computer controlled DSKY test which verifies correct DSKY character display. A manual DSKY keyboard test is performed to verify correct key-character display. An alarm and Interrupt Test checks computer program error sensing capabilities. Finally a computer controlled test of PIPA and IUG operation is performed with CG, IG and MG at 45 degrees. In this position each PIPA Ia is sensing some portion of positive g and the accumulative PIPA</p>											
Rev.	Date	TORR NO.	PAGES	REVISED	APPROVAL		REFERENCES				
Let.			JDC	D.S.	MJ	NASA					
A	8-25-66	29177	2-5	All	MN	ACMA					
							IMPORTANT				
							INTERVAL				
							TOOLS AND MATERIAL				

DESCRIPTION (Cont)	
measurement should be the value of local & IRIG performance is checked by measuring the effect of the horizontal component of earth rate ( $\cos x$ ) in the same orientation. The IRIG and PIPA test is performed at normal, low and high prime power levels with the LGC Self Check being performed concurrently.	
INITIALIZATION	
1. Insure that the system is in ISS STANDBY with the Computer operating and the CGC/LGC POWER ON and 400 CPS POWER ON pushbuttons on the Test Control panel are lighted.	3. Observe that all 9's are displayed in the PROC, VERB, NOUN and Row 1, Row 2, Row 3 character positions. Check that all applicable electroluminescent elements are lighted. Including the 9's, the following shall be displayed for approximately 5 seconds.  a. 9's b. 8's c. 7's d. 6's e. 5's f. 4's g. 3's h. 2's i. 1's
DSKY CHECK	
2. Perform the following DSKY operations: VERB 21    Noun 27    ENTR 00011                  ENTR	

JOB G & N SYSTEM OPERATIONAL TEST		JDC 12617 REV. A PAGE 2 OF 5
SUBSYSTEM	LEM G & N SYSTEM	ASSY
j. 0's k. Minus signs in ROW 1, ROW 2, ROW 3 l. VERB-NOUN Flashing m. COMP ACTY o. Plus signs in ROW 1, ROW 2, ROW 3 p. VERB-NOUN Flashing q. COMP ACTY r. COMP ACTY 4. Enter VERB 35 and press the pushbutton on the MAIN DSKY. The following DSKY displays shall illuminate for 5 seconds.	on concurrently for 5 seconds on currently for 5 seconds on for 5 seconds then DSKY blanks on for 5 seconds and press the pushbutton on the MAIN DSKY. The following DSKY displays shall illuminate for 5 seconds.	<b>MANUAL DSKY OPERATION CHECK</b> 5. Perform the following DSKY operations: a. VERB 24 NOUN 01 ENTR b. Observe VERB 24 Flashing ENTR c. 01700 d. Observe VERB 21 Flashing ENTR e. +12345 f. Observe VERB 22 NOUN 01 Flashing g. -67890 Do NOT press ENTR h. Observe that Row 1 contains +12345 and that Row 2 contains -67890. 7. Press CLR pushbutton twice on DSKY. Observe that Row 1 and Row 2 are blank.
	a. UPLINK ACTY b. NO ATT c. STEY d. KEY REL Flashing e. TEMP f. GIMBAL LOCK g. PROG h. RESTART i. TRACKER j. OPR ERROR Flashing k. COMP ACTY l. VERB-NOUN Flashing m. Plus 88888 in ROW 1, ROW 2 and ROW 3	<b>PARITY FAIL TEST</b> 8. Perform the following DSKY operations: a. VERB 57 ENTR b. 00015 ENTR c. VERB 21 NOUN 02 ENTR d. Observe VERB 21 Flashing ENTR e. 01600 f. Observe VERB 21 Flashing ENTR g. 33777 ENTR h. VERB 25 NOUN 26 ENTR i. Observe VERB 21 Flashing ENTR j. 04000 k. Observe VERB 22 NOUN 26 Flashing l. 01600 ENTR m. Observe VERB 23 NOUN 26 Flashing
	After indications a through l go out, plus 88888's shall remain on ROW 1, ROW 2 and ROW 3.	

JOB G & N SYSTEM OPERATIONAL TEST		JDC 12617 REV A PAGE 3 OF 5
SUBSYSTEM	LEM G & N SYSTEM	ASSY
n. 00003	ENTR	12. Verify that the RESTART condition lamp on the DSKY, the CGC/ LGC WARNING lamp and the G/ N CAUTION lamp on the Monitor panel are lighted. VERB 05 and NOUN 31 shall be displayed and Rows 1, 2 and 3 shall indicate 00000 on the MAIN DSKY.
o. VERB 30	ENTR	13. Press CAUT RESET pushbutton on the DSKY. Enter VERB 36 and press the ENTR pushbutton on the DSKY.
9. Verify that the RESTART condition lamp on the DSKY, the CGC WARNING lamp and the G/ N CAUTION lamp on the Monitor panel are lighted. VERB 05 and NOUN 31 shall be displayed and Rows 1, 2, and 3 shall indicate 00000 on the DSKY.		14. Perform the following DSKY operations:
10. Press CAUT RESET pushbutton on the DSKY. Enter VERB 36 and press the ENTR pushbutton on the DSKY.		a. VERB 21 NOUN 02 ENTR
<u>RUPT LOCK</u>		b. Observe VERB 21 Flashing ENTR
11. Perform the following DSKY operations:		c. 01600
a. VERB 24 NOUN 01	ENTR	d. Observe VERB 21 Flashing ENTR
b. Observe VERB 24	NOUN 01	e. 01600
c. 01600		f. VERB 25 NOUN 26 ENTR
d. Observe VERB 21	NOUN 01	g. Observe VERB 21 Flashing ENTR
e. 30001		h. VERB 25 NOUN 26 ENTR
f. Observe VERB 22	NOUN 01	i. Observe VERB 21 Flashing ENTR
g. 01600		j. VERB 21 NOUN 26 Flashing ENTR
h. VERB 25 NOUN 26		k. Observe VERB 22 Flashing ENTR
i. Observe VERB 21	NOUN 26	l. 01600
j. 00001		m. Observe VERB 23 Flashing ENTR
k. Observe VERB 22	NOUN 26	n. 00003
l. 01600		o. VERB 31
m. Observe VERB 23	NOUN 26	
n. 00003		
o. VERB 31		

JOB G & N SYSTEM OPERATIONAL TEST		JDC 12617 REV A PAGE 4 OF 5
SUBSYSTEM	LEM G & N SYSTEM	ASSY
lighted. VERB 05 and NOUN 31 shall be displayed and Rows 1, 2 and 3 shall indicate 00000 on the MAIN DSKY.		and 3 shall indicate 00000 on the MAIN DSKY.
16. Press CAUT RESET pushbutton on the DSKY. Enter VERB 36 and press the ENTR pushbutton on the DSKY.		19. Press CAUT RESET pushbutton on DSKY. Enter VERB 36 and press the ENTR pushbutton on the DSKY.
NIGHT WATCHMAN TEST		18. Press ISS TEST INITIALIZATION
17. Perform the following MAIN DSKY operations:		20. Press ISS OPERATE pushbutton on the Test Control panel.
a. VERB 24 NOUN 01 ENTR		21. Connect the input bus to the Digital Voltmeter (DVM) by setting the CROSSBAR CONTROL on the Primary Signal Selector panel to 173.
b. Observe VERB 24 NOUN 01 Flashing ENTR		22. Adjust the G & N POWER ADJUST control on the Test Control panel until the DVM indicates an input bus voltage of 28.0 (+0.25) vdc. Record indication.
c. 01600		LGC SELF CHECK
d. Observe VERB 21 NOUN 01 Flashing ENTR		23. Perform the following DSKY operations:
e. 30001		a. VERB 21 NOUN 27 ENTR
f. Observe VERB 22 NOUN 01 Flashing ENTR		b. Observe VERB 21 NOUN 27 Flashing ENTR
g. 01600		c. 77767 ENTR
h. VERB 25 NOUN 26 ENTR		24. Insure that at least 90 seconds have elapsed since performing Step 20 and that the PIPA loops have closed as indicated by a butterfly pattern on the PIPA monitor scope of the OIA.
i. Observe VERB 21 NOUN 26 Flashing ENTR		25. Perform the following DSKY operations:
j. 03400		a. VERB 57 ENTR
k. Observe VERB 22 NOUN 26 Flashing ENTR		b. Observe VERB 21 NOUN 01 Flashing ENTR
l. 01600		
m. Observe VERB 23 NOUN 26 Flashing ENTR		
n. 00003		
o. VERB 30 ENTR		
18. Verify that the RESTART condition lamp on the DSKY, the CGC/LGC WARNING lamp and the G/N CAUTION lamp on the Monitor panel are lighted. VERB 05 and NOUN 31 shall be displayed and Rows 1, 2		

## SUBSYSTEM LEM G &amp; N SYSTEM

c. 00004

d. Observe

VERB 16 NOUN 20 Displayed

26. In approximately 12 minutes VERB 06

and NOUN 66 will flash. Local gravity as

measured by X, Y, and Z PIPA will be dis-

played in Row 1 and Row 2. Record indica-

tions. (During the 12 minute interval,

Rows 1, 2, and 3 will indicate approximately

04500, 31500 and 04500, respectively.)

27. Enter VERB 33 and press ENTR

pushbutton on the DSKY.

28. When VERB 06 and NOUN 66 flash the

horizontal component of earth rate on the X,

Y and Z IRIGS will be displayed in Row 2.

Record indication.

29. Connect the input bus to the Digital

Voltmeter (DVM) by setting the CROSSBAR

CONTROL on the Primary Signal Selector

panel to 173.

30. Adjust the G &amp; N POWER ADJUST

control on the Test Control panel until the

DVM indicates input bus voltage of

24.5 (+0.25, -0) vdc. Record indication.

PIPA AND IRIG TEST (Low Voltage)

31. Enter VERB 36 and press the ENTR

pushbutton on the DSKY.

32. Repeat steps 23 through 28.

33. Connect the input bus to the Digital

Voltmeter (DVM) by setting the CROSSBAR

CONTROL on the Primary Signal Selector

panel to 173.

ASSY

34. Adjust the G &amp; N POWER ADJUST

control on the Test Control panel until the

DVM indicates an input bus voltage of

33.5 (+0.25, -0) vdc. Record indication.

PIPA AND IRIG TEST (High Voltage)

35. Enter VERB 36 and press the ENTR

pushbutton on the DSKY.

36. Repeat steps 23 through 28.

37. Enter VERB 36 and press the ENTR

pushbutton on the DSKY.

38. Connect the input bus to the Digital

Voltmeter (DVM) by setting the CROSSBAR

CONTROL on the Primary Signal Selector

panel to 173.

39. Adjust the G &amp; N POWER ADJUST

control on the Test Control panel until the

DVM indicates an input bus voltage of

28.0 (+0.25) vdc.

Horizontal Earth Rate Tolerances		
LOCATION	MIN VALUE	MAX VALUE
MIT	00000.64000	00000.84000
AC	00000.64000	00000.84000
MSC	00000.76000	00000.91000
NAA	00000.70000	00000.90000
MILA	00000.79000	00000.91000
GAEC	00000.65750	00000.85750

Table 1

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## APOLLO G&amp;N

## EQUIPMENT TEST

DATA SHEET 1 OF 2

JOB G &amp; N SYSTEM OPERATIONAL TEST

TITLE _____		DATE _____		SITE / LOCATION _____	
SER. NO. _____	DWG. REV. _____	TIME START _____	TIME END _____	TOTAL ELAPSED _____	
MAJOR GROUND SUPPORT EQUIPMENT					
NAME _____		SER. NO. _____		CAL DATE _____	
NAME _____		SER. NO. _____		CAL DATE _____	
CONDUCTED BY _____ NAME/AFFILIATION _____					
APPROVED BY _____ NAME/AFFILIATION _____					

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ ACC
1 thru 18	Displays			All DSKY character and condition lamps performed as required		
22	IMU 28 vdc Bus	vdc	27.75		28.25	
26	gravity	cm/sec <sup>2</sup>	975.0	R1 ----- R2 -----	985.9	
28	Horizontal earth rate (R2)	ERU	See Table 1		See Table 1	
30	IMU 28 vdc Bus	vdc	24.5		25.0	
32(26)	gravity	cm/sec <sup>2</sup>	975.0		985.9	
32(26)	Horizontal earth rate (R2)	ERU	See Table 1		See Table 1	
34	IMU 28 vdc Bus	vdc	33.5		33.75	
36(26)	gravity	cm/sec <sup>2</sup>	975.0		985.9	

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## APOLLO G&amp;N

## EQUIPMENT TEST

DATA SHEET 2 OF 2

JOB G &amp; N SYSTEM OPERATIONAL TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ ACC
36(26)	Horizontal earth rate (R2)	ERU	See Table 1		See Table 1	

COMMENTS

DATE 15 MAR 66

SUBSYSTEM LEM G & N SYSTEM			ASSY	
DESCRIPTION The purpose of this test is to check gross G & N System operation. Computer-DSKY Interface is checked by performing a computer controlled DSKY test which verifies correct DSKY character displays. A manual DSKY keyboard test is performed to verify correct key-character display operation. An alarm and Interrupts Test checks computer program error sensing capabilities. Finally a computer controlled test of PIPA and IRIG operation is performed with OG, IG and MG at 45 degrees. In this position each PIPA <sub>A</sub> is sensing some portion of positive g and the accumulative PIPA				
Rev.	Date	TDRR NO.	PAGES REVISED	APPROVAL
A	5-25-66	29177	2-5	JDC D.S. MIT NASA
B	7-21-66	30272	3, 4	ALL <del>MM</del> <del>EA</del> <del>MB</del>
REFERENCES				
IMPORTANT				
INTERVAL				
TOOLS AND MATERIAL				

DESCRIPTION (Cont)

measurement should be the value of local g. IRIG performance is checked by measuring the effect of the horizontal component of earth rate (cos x) in the same orientation. The IRIG and PIPA test is performed at normal, low and high prime power levels with the LGC Self Check being performed concurrently.

#### INITIALIZATION

1. Insure that the system is in ISS STANDBY with the Computer operating and the CGC/LGC POWER ON and 400 CPS POWER ON pushbuttons on the Test Control panel are lighted.

#### DSKY CHECK

2. Perform the following DSKY operations:  
VERB 21 NOUN 27 ENTR  
00011 ENTR

VERIFICATION WITH SIDL REQUIRED BEFORE USE

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J. 0's  
k. Minus signs in ROW 1, on concurrently  
ROW 2, ROW 3 for 5 seconds  
l. VERB-NOUN Flashing  
m. COMP ACTY  
o. Plus signs in ROW 1, on currently  
ROW 2, ROW 3 for 5 seconds  
p. VERB-NOUN Flashing  
q. COMP ACTY  
r. COMP ACTY on for 5 seconds then DSKY blanks

4. Enter VERB 35 and press the ENTR pushbutton on the MAIN DSKY. The following DSKY displays shall illuminate for 5 seconds.

#### ALARM AND INTERRUPT TEST

#### PARITY FAIL TEST

8. Perform the following DSKY operations:  
a. VERB 57 ENTR  
b. 00015 ENTR  
c. VERB 21 NOUN 02 ENTR  
d. Observe VERB 21 Flashing  
e. 01600 ENTR  
f. Observe VERB 21 Flashing  
g. 33777 ENTR  
h. VERB 25 NOUN 26 ENTR  
i. Observe VERB 21 Flashing  
j. 04000 ENTR  
k. Observe VERB 22 Flashing  
l. 01600 ENTR  
m. Observe VERB 23 Flashing

After indications a through l go out, plus 88888's shall remain on ROW 1, ROW 2 and ROW 3.

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n. 00003 ENTR  
o. VERB 30 ENTR

9. Verify that the RESTART condition lamp on the DSKY and the G/N CAUTION lamp on the Monitor panel are lighted. VERB 05 and NOUN 31 shall be displayed and Rows 1, 2 and 3 shall indicate 00000 on the MAIN DSKY.

10. Press CAUT RESET pushbutton on the DSKY. Enter VERB 36 and press the ENTR pushbutton on the DSKY.

#### TRAP LOCK

11. Perform the following DSKY operations:

a. VERB 24 NOUN 01 ENTR  
b. Observe VERB 24 Flashing  
c. 01600 ENTR  
d. Observe VERB 21 Flashing  
e. 30001 ENTR  
f. Observe VERB 22 Flashing  
g. 01600 ENTR  
h. VERB 25 NOUN 26 ENTR  
i. Observe VERB 21 Flashing  
j. 00001 ENTR  
k. Observe VERB 22 Flashing  
l. 01600 ENTR  
m. Observe VERB 23 Flashing  
n. 00003 ENTR  
o. VERB 31 ENTR

and 3 shall indicate 00000 on the MAIN DSKY.

19. Press CAUT RESET pushbutton on DSKY. Enter VERB 36 and press the ENTR pushbutton on the DSKY.

IRIG AND PIPA TEST INITIALIZATION

20. Press ES OPERATE pushbutton on the Test Control panel.

21. Connect the input bus to the Digital Voltmeter (DVM) by setting the CROSSBAR CONTROL on the Primary Signal Selector panel to 173.

22. Adjust the G & N POWER ADJUST control on the Test Control panel until the DVM indicates an input bus voltage of 28.0 (±0.25) vdc. Record indication.

#### LGC SELF CHECK

23. Perform the following DSKY operations:

a. VERB 21 NOUN 27 ENTR  
b. Observe VERB 21 Flashing  
c. 77767 ENTR  
24. Insure that at least 90 seconds have elapsed since performing Step 20 and that the PIPA loops have closed as indicated by a butterfly pattern on the PIPA monitor scope of the OIA.

PIPA AND IRIG TEST (Nominal Voltage)

25. Perform the following DSKY operations:

a. VERB 57 ENTR  
b. Observe VERB 21 Flashing

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## SUBSYSTEM LEM G &amp; N SYSTEM

ASSY

c. 00004 ENTR

d. Observe VERB 16 NOUN 20 Displayed

26. In approximately 12 minutes VERB 06 and NOUN 66 will flash. Local gravity as measured by X, Y, and Z PIPA will be displayed in Row 1 and Row 2. Record indications. (During the 12 minute interval,

Rows 1, 2, and 3 will indicate approximately 04500, 31500 and 04500, respectively.)

27. Enter VERB 33 and press ENTR pushbutton on the DSKY.

28. When VERB 06 and NOUN 66 flash the

horizontal component of earth rate on the X, Y and Z IRIGS will be displayed in Row 2. Record indication.

29. Connect the input bus to the Digital

Voltmeter (DVM) by setting the CROSSBAR CONTROL on the Primary Signal Selector panel to 173.

30. Adjust the G & N POWER ADJUST control on the Test Control panel until the

DVM indicates input bus voltage of 24.5 (+0.25, -0) vdc. Record indication.

PIPA AND IRIG TEST (Low Voltage)

31. Enter VERB 36 and press the ENTR pushbutton on the DSKY.

32. Repeat steps 23 through 28.

33. Connect the input bus to the Digital

Voltmeter (DVM) by setting the CROSSBAR CONTROL on the Primary Signal Selector

panel to 173.

34. Adjust the G & N POWER ADJUST control on the Test Control panel until the DVM indicates an input bus voltage of 33.5 (+0.25, -0) vdc. Record indication.

PIPA AND IRIG TEST (High Voltage)

35. Enter VERB 36 and press the ENTR pushbutton on the DSKY.

36. Repeat steps 23 through 28.

37. Enter VERB 36 and press the ENTR pushbutton on the DSKY.

38. Connect the input bus to the Digital

Voltmeter (DVM) by setting the CROSSBAR CONTROL on the Primary Signal Selector

panel to 173.

39. Adjust the G & N POWER ADJUST control on the Test Control panel until the

DVM indicates an input bus voltage of 28.0 (+0.25) vdc.

## Horizontal Earth Rate Tolerances

LOCATION	MIN VALUE	MAX VALUE
MIT	00000, 64000	00000, 84000
AC	00000, 64000	00000, 84000
MSC	00000, 76000	00000, 91000
NAA	00000, 70000	00000, 90000
MILA	00000, 79000	00000, 91000
GAEC	00000, 65750	00000, 85730

Table 1

DATE 15 MAR 66

APOLLO G&N  
EQUIPMENT TEST  
DATA SHEET 2 OF 2JDC  
NO. 12617  
REV. B

## JOB G &amp; N SYSTEM OPERATIONAL TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ A/C
36 (28)	Horizontal earth rate (R2)	ERU	See Table 1		See Table 1	

COMMENTS

APOLLO G&N  
EQUIPMENT TEST  
DATA SHEET 1 OF 2JDC  
NO. 12617  
REV. B  
INITIAL TDRR 27134

## JOB G &amp; N SYSTEM OPERATIONAL TEST

ASSEMBLY UNDER TEST		TEST HISTORY	
TITLE	DATE	START	END
SER. NO.	DWG	REV.	SITE / LOCATION
MAJOR GROUND SUPPORT EQUIPMENT		TIME	TOTAL ELAPSED
NAME		SER. NO.	CAL DATE
NAME		SER. NO.	CAL DATE

CONDUCTED BY	NAME/AFFILIATION	APPROVED BY	NAME/AFFILIATION
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JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ ACC
1 thru 18	Displays	All DSKY character and condition lamps performed as required				
22	IMU 28 vdc Bus	vdc	27.75	R1	R2	28, 25
26	gravity	cm/sec <sup>2</sup>	975.0			985.9
28	Horizontal earth rate (R2)	ERU	See Table 1			See Table 1
30	IMU 28 vdc Bus	vdc	24.5			25.0
32(26)	gravity	cm/sec <sup>2</sup>	975.0			985.9
32(28)	Horizontal earth rate (R2)	ERU	See Table 1			See Table 1
34	IMU 28 vdc Bus	vdc	33.5			33, 75
36(26)	gravity	cm/sec <sup>2</sup>	975.0			985.9

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FORM 10146  
Chg. 1-3-65

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SUBSYSTEM LEM G & N SYSTEM

DESCRIPTION The purpose of this test is to check gross G & N System operation. Computer-DSKY interface is checked by performing a computer controlled DSKY test which verifies correct DSKY character displays. A manual DSKY keyboard test is performed to verify correct key-character display operation. An alarm and Interrupts Test checks computer program error sensing capabilities. Finally a computer controlled test of PIPA and IRIG operation is performed with OG, IG and MG at 45 degrees. In this position each PIPA I<sub>A</sub> is sensing some portion of positive g and the accumulative PIPA

Rev.	Date	TDRR		PAGES REVISED		APPROVAL		REFERENCES	
		NO.	JDC	D.S.	MIT	NASA			
A	25-66	29177	2-5	ALL	MM	ACM			
B	2-66	30272	3, 4		EA	MB			
C	8-4-66	30519	2, 5	1	EA				IMPORTANT
									INTERVAL
									TOOLS AND MATERIAL

DESCRIPTION (Cont)

3. Observe that all 9's are displayed in the PROG, VERB, NOUN and Row 1, Row 2, Row 3 character positions. Check that all applicable electroluminescent elements are lighted. Including the 9's, the following shall be displayed for approximately 5 seconds.

- a. 9's  
b. 8's  
c. 7's  
d. 6's  
e. 5's  
f. 4's  
g. 3's  
h. 2's  
i. 1's

INITIALIZATION

1. Insure that the system is in ISS STANDBY with the Computer operating and the CGC/LGC POWER ON and 400 CPS POWER ON pushbuttons on the Test Control panel are lighted.

DSKY CHECK

2. Perform the following DSKY operations:  
VERB 21 NOUN 27 ENTR  
00011 ENTR

VERIFICATION WITH SIDL REQUIRED BEFORE USE  
DATE 15 MAR 66

ASSY

MANUAL DSKY OPERATION CHECK

5. Perform the following DSKY operations:  
a. VERB 24 NOUN 01 ENTR  
b. Observe VERB 24 NOUN 01 Flashing  
c. 01700 ENTR  
d. Observe VERB 21 NOUN 01 Flashing  
e. +12345 ENTR  
f. Observe VERB 22 NOUN 01 Flashing  
g. -67890 Do NOT press ENTR  
6. Observe that Row 1 contains +12345 and that Row 2 contains -67890.  
7. Press CLR pushbutton twice on DSKY. Observe that Row 1 and Row 2 are blank.

ALARM AND INTERRUPT TEST

PARTY FAIL TEST

8. Perform the following DSKY operations:  
a. VERB 57 ENTR  
b. 00015 ENTR  
c. VERB 21 NOUN 02 ENTR  
d. Observe VERB 21 NOUN 02 Flashing  
e. 01600 ENTR  
f. Observe VERB 21 NOUN 02 Flashing  
g. 33777 ENTR  
h. VERB 25 NOUN 26 ENTR  
i. Observe VERB 21 NOUN 26 Flashing  
j. 04000 ENTR  
k. Observe VERB 22 NOUN 26 Flashing  
l. 01600 ENTR  
m. Observe VERB 23 NOUN 26 Flashing

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ASSY

- n. 00003 ENTR  
o. VERB 30 ENTR
9. Verify that the RESTART condition lamp on the DSKY, and the G/N CAUTION lamp on the Monitor panel are lighted. VERB 05 and NOUN 31 shall be displayed and Rows 1, 2, and 3 shall indicate 00000 on the DSKY.
10. Press CAUT RESET pushbutton on the DSKY. Enter VERB 36 and press the ENTR pushbutton on the DSKY.

TRAP LOCK

11. Perform the following DSKY operations:

- a. VERB 24 NOUN 01 ENTR  
b. Observe VERB 24 NOUN 01 Flashing  
c. 01600 ENTR  
d. Observe VERB 21 NOUN 01 Flashing  
e. 30001 ENTR  
f. Observe VERB 22 NOUN 01 Flashing  
g. 01600 ENTR  
h. VERB 25 NOUN 26 ENTR  
i. Observe VERB 21 NOUN 26 Flashing  
j. 00001 ENTR  
k. Observe VERB 22 NOUN 26 Flashing  
l. 01600 ENTR  
m. Observe VERB 23 NOUN 26 Flashing  
n. 00003 ENTR  
o. VERB 31 ENTR

ASSY

- lighted. VERB 05 and NOUN 31 shall be displayed and Rows 1, 2 and 3 shall indicate 00000 on the MAIN DSKY.
16. Press CAUT RESET pushbutton on the DSKY. Enter VERB 36 and press the ENTR pushbutton on the DSKY.
- NIGHT WATCHMAN TEST
17. Perform the following MAIN DSKY operations:
- a. VERB 24 NOUN 01 ENTR  
b. Observe VERB 24 NOUN 01 Flashing  
c. 01600 ENTR  
d. Observe VERB 21 NOUN 01 Flashing  
e. 30001 ENTR  
f. Observe VERB 22 NOUN 01 Flashing  
g. 01600 ENTR  
h. VERB 25 NOUN 26 ENTR  
i. Observe VERB 21 NOUN 26 Flashing  
j. 03400 ENTR  
k. Observe VERB 22 NOUN 26 Flashing  
l. 01600 ENTR  
m. Observe VERB 23 NOUN 26 Flashing  
n. 00003 ENTR  
o. VERB 30 ENTR
18. Verify that the RESTART condition lamp on the DSKY and the G/N CAUTION lamp on the Monitor panel are lighted. VERB 05 and NOUN 31 shall be displayed and Rows 1, 2

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SUBSYSTEM LEM G & N SYSTEM

- c. 00004 ENTR
- d. Oserve NOUN 20 Displayed
26. In approximately 12 minutes VERB 06 and NOUN 66 will flash. Local gravity as measured by X, Y, and Z PIPA will be displayed in Row 1 and Row 2. Record indications. (During the 12 minute interval, Rows 1, 2, and 3 will indicate approximately 04500, 31500 and 04500, respectively.)
27. Enter VERB 33 and press ENTR pushbutton on the DSKY.
28. When VERB 06 and NOUN 66 flash the horizontal component of earth rate on the X, Y and Z IRIGS will be displayed in Row 2. Record indication.
29. Connect the input bus to the Digital Voltmeter (DVM) by setting the CROSSBAR CONTROL on the Primary Signal Selector panel to 173.
30. Adjust the G & N POWER ADJUST control on the Test Control panel until the DVM indicates input bus voltage of 24.5 (+0.25, -0) vdc. Record indication.
- PIPA AND IRIG TEST (Low Voltage)
31. Enter VERB 36 and press the ENTR pushbutton on the DSKY.
32. Repeat steps 23 through 28.
33. Connect the input bus to the Digital Voltmeter (DVM) by setting the CROSSBAR CONTROL on the Primary Signal Selector panel to 173.

Horizontal Earth Rate Tolerances		
LOCATION	MIN VALUE	MAX VALUE
MIT	00000.64000	00000.84000
AC	00000.64000	00000.84000
MSC	00000.76000	00000.91000
NAA	00000.70000	00000.90000
MILA	00000.79000	00000.91000
GAEC	00000.65750	00000.85750

Table 1

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APOLLO G&N  
EQUIPMENT TEST  
DATA SHEET 1 OF 2

JOB G & N SYSTEM OPERATIONAL TEST

TITLE _____		DATE _____		SITE / LOCATION _____	
SER. NO. _____	DWG _____	REV. _____	TIME _____	START _____	TOTAL ELAPSED _____
MAJOR GROUND SUPPORT EQUIPMENT					
NAME _____		SER. NO. _____		CAL DATE _____	
NAME _____		SER. NO. _____		CAL DATE _____	
CONDUCTED BY _____		NAME/AFFILIATION _____		APPROVED BY _____	
NAME/AFFILIATION _____		NAME/AFFILIATION _____		NAME/AFFILIATION _____	

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ ACC
1 thru 18	Displays					
	All DSKY character and condition lamps performed as required					
22	IMU 28 vdc Bus	vdc	27.75		28.25	
26	gravity	cm/sec <sup>2</sup>	975.0	R1	R2	985.9
28	Horizontal earth rate (R2)	ERU	See Table 1		See Table 1	
30	IMU 28 vdc Bus	vdc	24.5		24.75	
32(26)	gravity	cm/sec <sup>2</sup>	975.0		985.9	
32(28)	Horizontal earth rate (R2)	ERU	See Table 1		See Table 1	
34	IMU 28 vdc Bus	vdc	32.5		32.75	
36(26)	gravity	cm/sec <sup>2</sup>	975.0		985.9	

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APOLLO G&N  
EQUIPMENT TEST  
DATA SHEET 2 OF 2

JOB G & N SYSTEM OPERATIONAL TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ ACC
36 (26)	Horizontal earth rate (R2)	ERU	See Table 1		See Table 1	

COMMENTS

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## SUBSYSTEM LEM G &amp; N SYSTEM

c. 00004

ASSY

d. Observe

NOUN 20 Displayed

26. In approximately 12 minutes VERB 06

and NOUN 66 will flash. Local gravity as

measured by X, Y, and Z PIPA will be dis-

played in Row 1 and Row 2. Record indica-

tions. (During the 12 minute interval,

Rows 1, 2, and 3 will indicate approximately

04500, 31500 and 04500, respectively.)

27. Enter VERB 33 and press ENTR

pushbutton on the DSKY.

28. When VERB 06 and NOUN 66 flash the

horizontal component of earth rate on the X,

Y and Z IRIGS will be displayed in Row 2.

Record indication.

29. Connect the input bus to the Digital

Voltmeter (DVM) by setting the CROSSBAR

CONTROL on the Primary Signal Selector

panel to 173.

30. Adjust the G &amp; N POWER ADJUST

control on the Test Control panel until the

DVM indicates input bus voltage of

24.5 (+0.25, -0) vdc. Record indication.

PIPA AND IRIG TEST (Low Voltage)

31. Enter VERB 36 and press the ENTR

pushbutton on the DSKY.

32. Repeat steps 23 through 28.

33. Connect the input bus to the Digital

Voltmeter (DVM) by setting the CROSSBAR

CONTROL on the Primary Signal Selector

panel to 173.

34. Adjust the G &amp; N POWER ADJUST

control on the Test Control panel until the

DVM indicates an input bus voltage of

32.5 (+0.25, -0) vdc. Record indication.

PIPA AND IRIG TEST (High Voltage)

35. Enter VERB 36 and press the ENTR

pushbutton on the DSKY.

36. Repeat steps 23 through 28.

37. Enter VERB 36 and press the ENTR

pushbutton on the DSKY.

38. Connect the input bus to the Digital

Voltmeter (DVM) by setting the CROSSBAR

CONTROL on the Primary Signal Selector

panel to 173.

39. Adjust the G &amp; N POWER ADJUST

control on the Test Control panel until the

DVM indicates an input bus voltage of

28.0 (+0.25) vdc.

## Horizontal Earth Rate Tolerances

LOCATION	MIN VALUE	MAX VALUE
MIT	00000, 64000	00000, 84000
AC	00000, 64000	00000, 84000
MSC	00000, 76000	00000, 91000
NAA	00000, 70000	00000, 90000
MILA	00000, 79000	00000, 91000
GAEC	00000, 65750	00000, 85750

Table 1

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FORM 10-115  
CIR. 7-3-65APOLLO G&N  
EQUIPMENT TEST

DATA SHEET 2 OF 2

JOB G &amp; N SYSTEM OPERATIONAL TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ ACC
36 (28)	Horizontal earth rate (R2)	ERU	See Table 1		See Table 1	

COMMENTS

## APOLLO G&amp;N

## EQUIPMENT TEST

DATA SHEET 1 OF 2

JOB G &amp; N SYSTEM OPERATIONAL TEST

TITLE _____		DATE _____		END _____		SITE / LOCATION _____	
SER. NO. _____		DWG _____		REV. _____		TOTAL ELAPSED _____	
MAJOR GROUND SUPPORT EQUIPMENT							
NAME _____		SER. NO. _____		CAL DATE _____			
NAME _____		SER. NO. _____		CAL DATE _____			

CONDUCTED BY \_\_\_\_\_ NAME / AFFILIATION \_\_\_\_\_

APPROVED BY \_\_\_\_\_

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ ACC
1 thru 18	Displays					
22	IMU 28 vdc Bus	vdc	27.75		28.25	
26	gravity	cm/sec <sup>2</sup>	975.0	R1 R2	985.9	
28	Horizontal earth rate (R2)	ERU	See Table 1		See Table 1	
30	IMU 28 vdc Bus	vdc	24.5		24.75	
32(26)	gravity	cm/sec <sup>2</sup>	975.0		985.9	
32(28)	Horizontal earth rate (R2)	ERU	See Table 1		See Table 1	
34	IMU 28 vdc Bus	vdc	32.5		32.75	
36(28)	gravity	cm/sec <sup>2</sup>	975.0		985.9	

All DSKY character and condition lamps performed as required

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FORM 10-115  
CIR. 7-3-65

DATE 15 MAR 66

FORM 10-115  
CIR. 7-3-65

SUBSYSTEM LEM G & N SYSTEM ASSY.

DESCRIPTION The purpose of this test is to check gross G & N System operation. Computer-DSKY interface is checked by performing a computer controlled DSKY test which verifies correct DSKY character displays. A manual DSKY keyboard test is performed to verify correct key-character display operation. An alarm and interrupts test checks computer program error sensing capabilities. Finally a computer controlled test of PIPA and IRIG operation is performed with OG, IG and MG at 45 degrees. In this position each PIPA A is sensing some portion of positive g and the accumulative PIPA

Rev.	Date	TDRR NO.	PAGES REVISED	APPROVAL	REFERENCES
1	5-25-66	29177	2-5	MIT	NASA
2	7-21-66	30272	3-4	ALL	MMW, JACM, EA, MB, EA, MB, EA, MB
3	8-4-66	30519	2-5	1	EA, MB, EA, MB, EA, MB
4	10-20-66	31617	1	EA, MB	EA, MB, EA, MB, EA, MB
5	2-2-67	32885	1-5	EA, MB	EA, MB, EA, MB, EA, MB
					INTERVAL
					TOOLS AND MATERIAL

#### DESCRIPTION (Cont)

measurement should be the value of local g. IRIG performance is checked by measuring the effect of the horizontal component of earth rate (cos x) in the same orientation. The IRIG and PIPA test is performed at normal, low and high prime power levels with the LGC Self Check being performed concurrently.

#### IMPORTANT: Obtain the

time of day of high order

scalar overflow from JDC

12614. To prevent erroneous

test results, do not enter a

PIPA and IRIG Test within

0.2 hours of that time.

#### INITIALIZATION

1. Insure that the system is in ISS

STANDBY with the Computer operating

and the CGC/LGC POWER ON and 400 CPS

POWER ON pushbuttons on the Test Con-

trol panel are lighted.

DATE 15 MAR 66

VERIFICATION WITH SIDL REQUIRED BEFORE USE

#### DSKY CHECK

2. Perform the following DSKY operations:  
VERB 21 NOUN 27 ENTR  
00011

3. Observe that all 9's are displayed in the PROG, VERB, NOUN and Row 1, Row 2, Row 3 character positions. Check that all applicable electroluminescent elements are lighted. Including the 9's, the following shall be displayed for approximately 5 seconds.

- a. 9's
- b. 8's
- c. 7's
- d. 6's
- e. 5's
- f. 4's
- g. 3's
- h. 2's
- i. 1's

#### MANUAL DSKY OPERATION CHECK

- 5. Perform the following DSKY operations:  
a. VERB 24 NOUN 01 ENTR
- b. Observe VERB 24 NOUN 01 Flashing ENTR
- c. 01700
- d. Observe VERB 21 NOUN 01 Flashing ENTR
- e. +12345
- f. Observe VERB 22 NOUN 01, Flashing ENTR
- g. -67890 Do NOT press ENTR
- 6. Observe that Row 1 contains +12345 and that Row 2 contains -67890.
- 7. Press CLR pushbutton twice on DSKY. Observe that Row 1 and Row 2 are blank.

#### ALARM AND INTERRUPT TEST

##### PARITY FAIL TEST

- 8. Perform the following DSKY operations:  
a. VERB 57 ENTR
- b. 00015
- c. VERB 21 NOUN 02 ENTR
- d. Observe VERB 21 NOUN 02 Flashing ENTR
- e. 01600
- f. Observe VERB 21 NOUN 02 Flashing ENTR
- g. 33777
- h. VERB 25 NOUN 26 ENTR
- i. Observe VERB 21 NOUN 26 Flashing ENTR
- j. 04000
- k. Observe VERB 22 NOUN 26 Flashing ENTR
- l. 01600
- m. Observe VERB 23 NOUN 26 Flashing ENTR

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After indications a through l go out, plus 88888's shall remain on ROW 1, ROW 2 and ROW 3.

SUBSYSTEM LEM G & N SYSTEM ASSY

12. Verify that the RESTART condition lamp on the DSKY and the G/N CAUTION lamp on the Monitor panel are lighted. VERB 05 and NOUN 31 shall be displayed and Rows 1, 2, and 3 shall indicate 00000 on the MAIN DSKY.

- 13. Press CAUT RESET pushbutton on the DSKY. Enter VERB 36 and press the ENTR pushbutton on the DSKY.
- 14. Perform the following DSKY operations:  
a. VERB 21 NOUN 02 ENTR
- b. Observe VERB 21 NOUN 02 Flashing ENTR
- c. 01600
- d. Observe VERB 21 NOUN 02 Flashing ENTR
- e. 01600
- f. VERB 25 NOUN 26 ENTR
- g. Observe VERB 21 NOUN 26 Flashing ENTR
- h. 04000
- i. Observe VERB 22 NOUN 26 Flashing ENTR
- j. 01600
- k. Observe VERB 23 NOUN 26 Flashing ENTR
- l. 00003
- m. VERB 30

15. Verify that the RESTART condition lamp on the DSKY, and the G/N CAUTION lamp on the Monitor panel are

lighted. VERB 05 and NOUN 31 shall be displayed and Rows 1, 2

shall be displayed and Rows 1, 2

shall be displayed and Rows 1, 2

shall be displayed and Rows 1, 2

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SUBSYSTEM LEM G & N SYSTEM ASSY

19. Press CAUT RESET pushbutton on the DSKY. Enter VERB 36 and press the ENTR pushbutton on the DSKY.

20. Press ISS OPERATE pushbutton on the Test Control panel.

21. Connect the input bus to the Digital Voltmeter (DVM) by setting the CROSSBAR CONTROL on the Primary Signal Selector panel to 173.

22. Adjust the G & N POWER ADJUST control on the Test Control panel until the DVM indicates an input bus voltage of 28.0 (±0.25) vdc. Record indication.

LGC SELF CHECK

23. Perform the following DSKY operations:

a. VERB 21 NOUN 27 ENTR

b. Observe VERB 21 NOUN 27 Flashing ENTR

c. 77767

24. Insure that at least 90 seconds have elapsed since performing Step 20 and that the PIPA loops have closed as indicated by a butterfly pattern on the PIPA monitor scope of the OIA.

PIPA AND IRIG TEST (Nominal Voltage)

25. Perform the following DSKY operations:

a. VERB 57 ENTR

b. Observe VERB 21 NOUN 01 Flashing

c. VERB 21 NOUN 01 Flashing

d. VERB 21 NOUN 01 Flashing

e. VERB 21 NOUN 01 Flashing

f. VERB 21 NOUN 01 Flashing

g. VERB 21 NOUN 01 Flashing

h. VERB 21 NOUN 01 Flashing

i. VERB 21 NOUN 01 Flashing

j. VERB 21 NOUN 01 Flashing

k. VERB 21 NOUN 01 Flashing

l. VERB 21 NOUN 01 Flashing

m. Observe VERB 23 NOUN 26 Flashing

n. 00003

o. VERB 30

18. Verify that the RESTART condition lamp on the DSKY and the G/N CAUTION lamp on the Monitor panel are lighted. VERB 05 and NOUN 31 shall be displayed and Rows 1, 2

shall be displayed and Rows 1, 2

shall be displayed and Rows 1, 2

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DATE 15 MAR 66

FORM 0014  
Chg. 7-23-66

SUBSYSTEM LEM G & N SYSTEM ASSY

DESCRIPTION The purpose of this test is to check gross G & N System operation. Computer-DSKY interface is checked by performing a computer controlled DSKY test which verifies correct DSKY character displays. A manual DSKY keyboard test is performed to verify correct key-character display operation. An alarm and interrupts Test checks computer program error sensing capabilities. Finally a computer controlled test of PIPA and IRIG operation is performed with OG, IG and MG at 45 degrees. In this position each PIPA  $I_A$  is sensing some portion of positive g and the accumulative PIPA

Rev.	Let.	Date	TORR	PAGES REVISED	APPROVAL	REFERENCES
				JDC	D.S.	MIT NASA
A	B-25-66	23177	2-5	ALL	MM	ACM
B	7-21-66	30272	3, 4	-	EA	MB
C	8-4-66	30519	2, 5	1	EA	-
D	10-20-66	31617	1	-	EA	-
E	2-2-67	32885	1, 5	-	EA	-
						INTERVAL
						TOOLS AND MATERIAL

DESCRIPTION (Cont)

measurement should be the value of local g. IRIG performance is checked by measuring the effect of the horizontal component of earth rate (cos  $\alpha$ ) in the same orientation. The IRIG and PIPA test is performed at normal, low and high prime power levels with the LGC Self Check being performed concurrently.

IMPORTANT: Obtain the

time of day of high order scalar overflow from JDC 12614. To prevent erroneous test results, do not enter a PIPA and IRIG Test within 0.2 hours of that time.

INITIALIZATION

1. Insure that the system is in ESS STANDBY with the Computer operating and the CCG/LGC POWER ON and 400 CPS POWER ON pushbuttons on the Test Control panel are lighted.

VERIFICATION WITH SID REQUIRED BEFORE USE

DATE 15 MAR 66

DSKY CHECK

2. Perform the following DSKY operations:  
VERB 21 NOUN 27 ENTR  
00011 ENTR

3. Observe that all 9's are displayed in the PROG, VERB, NOUN and Row 1, Row 2, Row 3 character positions. Check that all applicable electroluminescent elements are lighted, including the 9's, the following shall be displayed for approximately 5 seconds.

- a. 9's
- b. 8's
- c. 7's
- d. 6's
- e. 5's
- f. 4's
- g. 3's
- h. 2's
- i. 1's

SUBSYSTEM LEM G & N SYSTEM ASSY

12. Verify that the RESTART condition lamp on the DSKY and the G/N CAUTION lamp on the Monitor panel are lighted. VERB 05 and NOUN 31 shall be displayed and Rows 1, 2 and 3 shall indicate 00000 on the MAIN DSKY.

13. Press CAUT RESET pushbutton on the DSKY. Enter VERB 36 and press the ENTR pushbutton on the DSKY.

TC TRAP TEST

14. Perform the following DSKY operations:

- a. VERB 21 NOUN 02 ENTR
  - b. Observe VERB 21 NOUN 02 Flashing ENTR
  - c. 01600
  - d. Observe VERB 21 NOUN 02 Flashing ENTR
  - e. 01600
  - f. VERB 25 NOUN 26 ENTR
  - g. Observe VERB 21 NOUN 26 Flashing ENTR
  - h. 04000
  - i. Observe VERB 22 NOUN 26 Flashing ENTR
  - j. 01600
  - k. Observe VERB 23 NOUN 26 Flashing ENTR
  - l. 00003
  - m. VERB 30 ENTR
15. Verify that the RESTART condition lamp on the DSKY, and the G/N CAUTION lamp on the Monitor panel are

DATE 15 MAR 66

SUBSYSTEM LEM G & N SYSTEM ASSY

MANUAL DSKY OPERATION CHECK

- 5. Perform the following DSKY operations:
  - a. VERB 24 NOUN 01 ENTR
  - b. Observe VERB 24 NOUN 01 Flashing ENTR
  - c. 01700
  - d. Observe VERB 21 NOUN 01 Flashing ENTR
  - e. +12345
  - f. Observe VERB 22 NOUN 01, Flashing ENTR
  - g. -67890 Do NOT press ENTR
  - 6. Observe that Row 1 contains +12345 and that Row 2 contains -67890.
  - 7. Press CLR pushbutton twice on DSKY. Observe that Row 1 and Row 2 are blank.

ALARM AND INTERRUPT TEST

PARITY FAIL TEST

- 8. Perform the following DSKY operations:
    - a. VERB 57 ENTR
    - b. 00015
    - c. VERB 21 NOUN 02 ENTR
    - d. Observe VERB 21 NOUN 02 Flashing ENTR
    - e. 01600
    - f. Observe VERB 21 NOUN 02 Flashing ENTR
    - g. 33777
    - h. VERB 25 NOUN 26 ENTR
    - i. Observe VERB 21 NOUN 26 Flashing ENTR
    - j. 04000
    - k. Observe VERB 22 NOUN 26 Flashing ENTR
    - l. 01600
    - m. Observe VERB 23 NOUN 26 Flashing ENTR
- After indications a through i go out, plus 88888's shall remain on ROW 1, ROW 2 and ROW 3.

DATE 15 MAR 66

SUBSYSTEM LEM G & N SYSTEM ASSY

19. Press CAUT RESET pushbutton on DSKY. Enter VERB 36 and press the ENTR pushbutton on the DSKY.

20. Press ES OPERATE pushbutton on the Test Control panel.

21. Connect the input bus to the Digital Voltmeter (DVM) by setting the CROSSBAR CONTROL on the Primary Signal Selector panel to 173.

22. Adjust the G & N POWER ADJUST control on the Test Control panel until the DVM indicates an input bus voltage of 28.0 (+0.25) vdc. Record indication.

LGC SELF CHECK

23. Perform the following DSKY operations:

- a. VERB 21 NOUN 27 ENTR
- b. Observe VERB 21 NOUN 27 Flashing ENTR
- c. 77767
- 24. Insure that at least 90 seconds have elapsed since performing Step 20 and that the PIPA loops have closed as indicated by a butterfly pattern on the PIPA monitor scope of the OIA.
- 25. Perform the following DSKY operations:
  - a. VERB 57 ENTR
  - b. Observe VERB 21 NOUN 01 Flashing

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## SUBSYSTEM LEM G &amp; N SYSTEM

ASSY

c. 00004 ENTR  
d. Observe NOUN 20 Displayed  
e. VERB 34 ENTR

26. In approximately 12 minutes VERB 06 and NOUN 66 will flash. Local gravity as measured by X, Y, and Z PIPA will be displayed in Row 1 and Row 2. Record indications.

27. Enter VERB 33 and press ENTR pushbutton on the DSKY.

28. When VERB 06 and NOUN 66 flash the horizontal component of earth rate on the X, Y and Z IRIGS will be displayed in Row 2. Record indication.

29. Connect the input bus to the Digital Voltmeter (DVM) by setting the CROSSBAR CONTROL on the Primary Signal Selector panel to 173.

30. Adjust the G & N POWER ADJUST control on the Test Control panel until the DVM indicates input bus voltage of 24.5 (+0.25, -0) vdc. Record indication. PIPA AND IRIG TEST (Low Voltage)

31. Enter VERB 36 and press the ENTR pushbutton on the DSKY.

32. Repeat steps 23 through 28.

33. Connect the input bus to the Digital Voltmeter (DVM) by setting the CROSSBAR CONTROL on the Primary Signal Selector panel to 173.

34. Adjust the G & N POWER ADJUST control on the Test Control panel until the DVM indicates an input bus voltage of 32.5 (+0.25, -0) vdc. Record indication. PIPA AND IRIG TEST (High Voltage)

35. Enter VERB 36 and press the ENTR pushbutton on the DSKY.

36. Repeat steps 23 through 28.

37. Enter VERB 36 and press the ENTR pushbutton on the DSKY.

38. Connect the input bus to the Digital Voltmeter (DVM) by setting the CROSSBAR CONTROL on the Primary Signal Selector panel to 173.

39. Adjust the G & N POWER ADJUST control on the Test Control panel until the DVM indicates an input bus voltage of 28.0 (+0.25) vdc.

Horizontal Earth Rate Tolerances		
LOCATION	MIN VALUE	MAX VALUE
MIT	00000.64000	00000.94000
AC	00000.64000	00000.94000
MSC	00000.76000	00000.91000
NAA	00000.70000	00000.90000
MILA	00000.78000	00000.91000
GAEC	00000.65750	00000.85750

Table 1

DATE 15 MAR 66

APOLLO G&N  
EQUIPMENT TEST  
DATA SHEET 2 OF 2JDC  
NO. 12617  
REV. E

## JOB G &amp; N SYSTEM OPERATIONAL TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ ACC
36 (28)	Horizontal earth rate (R2)	ERU	See Table 1		See Table 1	

COMMENTS

DATE 15 MAR 66

FORM 00146  
Chg. 7-23 65APOLLO G&N  
EQUIPMENT TEST  
DATA SHEET 1 OF 2JDC  
NO. 12617  
REV. E  
INITIAL TDRR 27134

## JOB G &amp; N SYSTEM OPERATIONAL TEST

ASSEMBLY UNDER TEST		TEST HISTORY	
TITLE	DATE	START	END
SER. NO.	DWG	REV.	SITE / LOCATION
MAJOR GROUND SUPPORT EQUIPMENT		START	END
NAME		SER. NO.	CAL DATE
NAME		SER. NO.	CAL DATE
CONDUCTED BY		APPROVED BY	
NAME/AFFILIATION		NAME/AFFILIATION	

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ ACC
1 thru 18	Displays					
All DSKY character and condition lamps performed as required						
22	IMU 28 vdc Bus	vdc	27.75		28.25	
26	gravity	cm/sec <sup>2</sup>	975.0	R1	R2	985.9
28	Horizontal earth rate (R2)	ERU	See Table 1		See Table 1	
30	IMU 28 vdc Bus	vdc	24.5		24.75	
32(26)	gravity	cm/sec <sup>2</sup>	975.0		985.9	
32(28)	Horizontal earth rate (R2)	ERU	See Table 1		See Table 1	
34	IMU 28 vdc Bus	vdc	32.5		32.75	
36(26)	gravity	cm/sec <sup>2</sup>	975.0		985.9	

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FORM 00146  
Chg. 7-23 65



## SUBSYSTEM LEM G &amp; N SYSTEM

ASSY

c. 00004 ENTR

d. Observe VERB 16 NOUN 20 Displayed

e. VERB 34 ENTR

26. In approximately 12 minutes VERB 06 and NOUN 66 will flash. Local gravity as measured by X, Y, and Z PIPA will be displayed in Row 1 and Row 2. Record indications.

27. Enter VERB 33 and press ENTR pushbutton on the DSKY.

28. When VERB 06 and NOUN 66 flash the horizontal component of earth rate on the X, Y and Z IRIGs will be displayed in Row 2. Record indication.

29. Connect the input bus to the Digital Voltmeter (DVM) by setting the CROSSBAR CONTROL on the Primary Signal Selector panel to 173.

30. Adjust the G & N POWER ADJUST control on the Test Control panel until the DVM indicates input bus voltage of 24.5 (+0.25, -0) vdc. Record indication. PIPA AND IRIG TEST (Low Voltage)

31. Enter VERB 36 and press the ENTR pushbutton on the DSKY.

32. Repeat steps 23 through 28.

33. Connect the input bus to the Digital Voltmeter (DVM) by setting the CROSSBAR CONTROL on the Primary Signal Selector panel to 173.

34. Adjust the G & N POWER ADJUST control on the Test Control panel until the DVM indicates an input bus voltage of 32.5 (+0.25, -0) vdc. Record indication. PIPA AND IRIG TEST (High Voltage)

35. Enter VERB 36 and press the ENTR pushbutton on the DSKY.

36. Repeat steps 23 through 28.

37. Enter VERB 36 and press the ENTR pushbutton on the DSKY.

38. Connect the input bus to the Digital Voltmeter (DVM) by setting the CROSSBAR CONTROL on the Primary Signal Selector panel to 173.

39. Adjust the G & N POWER ADJUST control on the Test Control panel until the DVM indicates an input bus voltage of 28.0 (+0.25) vdc.

LOCATION	MIN VALUE	MAX VALUE
MIT	00000.64000	00000.84000
AC	00000.64000	00000.84000
MSC	00000.78000	00000.91000
NAA	00000.70000	00000.90000
MILA	00000.79000	00000.91000
GAEC	00000.65750	00000.85750

Table 1

DATE 15 MAR 66

APOLLO G&N  
EQUIPMENT TEST  
DATA SHEET 2 OF 2

JOB G &amp; N SYSTEM OPERATIONAL TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ ACC
36 (26)	Horizontal earth rate (R2)	ERU	See Table 1		See Table 1	

COMMENTS

JDC  
NO. 12617  
REV. E

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FOR LOTS  
Chg. 7-28-65APOLLO G&N  
EQUIPMENT TEST  
DATA SHEET 1 OF 2

JOB G &amp; N SYSTEM OPERATIONAL TEST

NO. 12617/JDC  
REV. E  
INITIAL TDRR 27134

ASSEMBLY UNDER TEST				TEST HISTORY			
TITLE	SER. NO.	DWG	REV.	DATE	START	END	SITE / LOCATION
				TIME	START	END	TOTAL ELAPSED
NAME _____ SER. NO. _____ CAL DATE _____							
NAME _____ SER. NO. _____ CAL DATE _____							
CONDUCTED BY _____ APPROVED BY _____							
JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ ACC	
1 thru 18	Displays						All DSKY character and condition lamps performed as required
22	IMU 28 vdc Bus	vdc	27.75		28.25		
26	gravity	cm/sec <sup>2</sup>	975.0	R1	R2	985.9	
28	Horizontal earth rate (R2)	ERU	See Table 1			See Table 1	
30	IMU 28 vdc Bus	vdc	24.5		24.75		
32(26)	gravity	cm/sec <sup>2</sup>	975.0			985.9	
32(28)	Horizontal earth rate (R2)	ERU	See Table 1			See Table 1	
34	IMU 28 vdc Bus	vdc	32.5		32.75		
36(26)	gravity	cm/sec <sup>2</sup>	975.0			985.9	

DATE 15 MAR 66

FOR LOTS  
Chg. 7-28-65

SUBSYSTEM LEM G & N SYSTEM			
DESCRIPTION The purpose of this test is to check gross G & N System operation. Computer-DSKY interface is checked by performing a computer controlled DSKY test which verifies correct DSKY character displays. A manual DSKY keyboard test is performed to verify correct key-character display operation. An alarm and interrupt test checks computer program error sensing capabilities. Finally a computer controlled test of PIPA and IRIG operation is performed with OG, IG and MG at 45 degrees. In this position each PIPA 1 is sensing some portion of positive g and the accumulative PIPA			
Rev.	TDRR NO.	PAGES REVISED	APPROVAL
1.	2.	3.	4.
A1	A 2-25-66 28172	2-5	ALL
B	B 7-21-66 30272	3-4	ALL
C	C 8-4-66 30519	2-5	1
D	D 10-20-66 31617	1	-
E	E 2-2-67 32885	1-5	-
F	F 7-27-67 34232	1	-
REFERENCES			
A1 A 2-25-66 28172 JDC D.S. M.I. NASA			
B 7-21-66 30272 JDC D.S. M.I. ACMA			
C 8-4-66 30519 JDC D.S. M.I. ACMA			
D 10-20-66 31617 JDC D.S. M.I. ACMA			
E 2-2-67 32885 JDC D.S. M.I. ACMA			
F 7-27-67 34232 JDC D.S. M.I. ACMA			
IMPORTANT See below.			
INTERVAL			
TOOLS AND MATERIAL			

DESCRIPTION (Cont)  
Measurement should be the value of local g. IRIG performance is checked by measuring the effect of the horizontal component of earth rate (cos x) in the same orientation. The IRIG and PIPA test is performed at normal, low and high prime power levels with the LGC Self Check being performed concurrently.

IMPORTANT: 1. Obtain the time of day of high order scalar overflow from JDC 12614. To prevent erroneous test results, do not enter a PIPA and IRIG Test within 0.2 hours of that time.

2. Insure that connector assembly (2003099) is removed and W226-P1 is connected to the LGC test connector before proceeding with this JDC.

#### INITIALIZATION

1. Insure that the system is in ISB STANDBY with the Computer operating and the CGC/LGC POWER ON and 400 CPS POWER ON pushbuttons on the Test Control panel are lighted.

VERIFICATION WITH SIDL REQUIRED BEFORE USE

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#### DSKY CHECK

2. Perform the following DSKY operations:  
VERB 21 NOUN 27 ENTR  
00011 ENTR

3. Observe that all 9's are displayed in the PROG, VERB, NOUN and Row 1, Row 2, Row 3 character positions. Check that all applicable electroluminescent elements are lighted, including the 9's, the following shall be displayed for approximately 5 seconds.

- a. 9's
- b. 8's
- c. 7's
- d. 6's
- e. 5's
- f. 4's
- g. 3's
- h. 2's
- i. 1's

j. 0's  
k. Minus signs in ROW 1, on concurrently ROW 2, ROW 3 for 5 seconds

1. VERB-NOUN Flashing

m. COMP ACTY

o. Plus signs in ROW 1, on currently ROW 2, ROW 3 for 5 seconds

p. VERB-NOUN Flashing

q. COMP ACTY

r. COMP ACTY on for 5 seconds then DSKY blanks

4. Enter VERB 36 and press the ENTR

pushbutton on the MAIN DSKY. The following DSKY displays shall illuminate for 5 seconds.

- a. UPLINK ACTY
- b. NO ATT
- c. STBY
- d. KEY REL Flashing
- e. TEMP
- f. GIMBAL LOCK
- g. PROG on concurrently for 5 seconds
- h. RESTART
- i. TRACKER
- j. OPR ERROR Flashing
- k. VERB-NOUN Flashing
- l. Plus 88888 in ROW 1, ROW 2 and ROW 3

After indications a through l go out, plus 88888's shall remain on ROW 1, ROW 2 and ROW 3.

#### MANUAL DSKY OPERATION CHECK

5. Perform the following DSKY operations:

- a. VERB 24 NOUN 01 ENTR
- b. Observe VERB 24 NOUN 01 Flashing ENTR
- c. 01700
- d. Observe VERB 21 NOUN 01 Flashing ENTR
- e. +12345
- f. Observe VERB 22 NOUN 01 Flashing ENTR
- g. -67890

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6. Observe that Row 1 contains +12345 and that Row 2 contains -67890.

7. Press CLR pushbutton twice on DSKY. Observe that Row 1 and Row 2 are blank.

#### ALARM AND INTERRUPT TEST

##### PARTY FAIL TEST

8. Perform the following DSKY operations:

- a. VERB 57 ENTR
- b. 00015 ENTR
- c. VERB 21 NOUN 02 ENTR
- d. Observe VERB 21 NOUN 02 Flashing ENTR
- e. 01600
- f. Observe VERB 21 NOUN 02 Flashing ENTR
- g. 33777
- h. VERB 25 NOUN 26 ENTR
- i. Observe VERB 21 NOUN 26 Flashing ENTR
- j. 04000
- k. Observe VERB 22 NOUN 26 Flashing ENTR
- l. 01600
- m. Observe VERB 23 NOUN 26 Flashing ENTR
- n. 00003
- o. VERB 30 ENTR
- p. Verify that the RESTART condition lamp on the DSKY and the G/N CAUTION lamp on the Monitor panel are lighted. VERB 05 and VERB 06 and NOUN 31 shall be displayed and Rows 1, 2, and 3 shall indicate 00000 on the DSKY.

10. Press CAUT RESET pushbutton on the

DSKY. Enter VERB 36 and press the ENTR pushbutton on the DSKY.

#### TRAP LOCK

11. Perform the following DSKY operations:

- a. VERB 24 NOUN 01 ENTR
- b. Observe VERB 24 NOUN 01 Flashing ENTR
- c. 01600
- d. Observe VERB 21 NOUN 01 Flashing ENTR
- e. 30001
- f. Observe VERB 22 NOUN 01 Flashing ENTR
- g. 01600
- h. VERB 25 NOUN 26 ENTR
- i. Observe VERB 21 NOUN 26 Flashing ENTR
- j. 00001
- k. Observe VERB 22 NOUN 26 Flashing ENTR
- l. 01600
- m. Observe VERB 23 NOUN 26 Flashing ENTR
- n. 00003
- o. VERB 31 ENTR

12. Verify that the RESTART condition lamp on the DSKY and the G/N CAUTION lamp on the Monitor panel are lighted. VERB 05 and NOUN 31 shall be displayed and Rows 1, 2 and 3 shall indicate 00000 on the MAIN DSKY.

13. Press CAUT RESET pushbutton on the DSKY. Enter VERB 36 and press the ENTR pushbutton on the DSKY.

#### TC TRAP TEST

14. Perform the following DSKY operations:

- a. VERB 21 NOUN 02 ENTR
- b. Observe VERB 21 NOUN 02 Flashing ENTR
- c. 01600
- d. Observe VERB 21 NOUN 02 Flashing ENTR
- e. 01600
- f. VERB 25 NOUN 26 ENTR
- g. Observe VERB 21 NOUN 26 Flashing ENTR
- h. 04000
- i. Observe VERB 22 NOUN 26 Flashing ENTR
- j. 01600
- k. Observe VERB 23 NOUN 26 Flashing ENTR
- l. 00003
- m. VERB 30 ENTR
- 15. Verify that the RESTART condition lamp on the DSKY, and the G/N CAUTION lamp on the Monitor panel are lighted. VERB 05 and NOUN 31 shall be displayed and Rows 1, 2 and 3 shall indicate 00000 on the MAIN DSKY.
- 16. Press CAUT RESET pushbutton on the DSKY. Enter VERB 36 and press the ENTR pushbutton on the DSKY.

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#### NIGHT WATCHMAN TEST

17. Perform the following MAIN DSKY operations:

- a. VERB 24 NOUN 01 ENTR
- b. Observe VERB 24 NOUN 01 Flashing ENTR
- c. 01600
- d. Observe VERB 21 NOUN 01 Flashing ENTR
- e. 30001
- f. Observe VERB 22 NOUN 01 Flashing ENTR
- g. 01600
- h. VERB 25 NOUN 26 ENTR
- i. Observe VERB 21 NOUN 26 Flashing ENTR
- j. 03400
- k. Observe VERB 22 NOUN 26 Flashing ENTR
- l. 01600
- m. Observe VERB 23 NOUN 26 Flashing ENTR
- n. 00003
- o. VERB 30 ENTR
- 18. Verify that the RESTART condition lamp on the DSKY and the G/N CAUTION lamp on the Monitor panel are lighted. VERB 05 and NOUN 31 shall be displayed and Rows 1, 2 and 3 shall indicate 00000 on the MAIN DSKY.
- 19. Press CAUT RESET pushbutton on DSKY. Enter VERB 36 and press the ENTR pushbutton on the DSKY.

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IRIG AND PIPA TEST INITIALIZATION  
20. Press ISS OPERATE pushbutton on the Test Control panel.

21. Connect the input bus to the Digital Voltmeter (DVM) by setting the CROSBAR CONTROL on the Primary Signal Selector panel to 173.

22. Adjust the G & N POWER ADJUST control on the Test Control panel until the DVM indicates an input bus voltage of 28.0 (+0.25) vdc. Record indication.

LGC SELF CHECK

23. Perform the following DSKY operations:

- a. VERB 21 NOUN 27 ENTR  
b. Observe VERB 21 NOUN 27 Flashing ENTR  
c. 77767  
24. Insure that at least 90 seconds have elapsed since performing Step 20 and that the PIPA loops have closed as indicated by a butterfly pattern on the PIPA monitor scope of the OIA.

PIPA AND IRIG TEST (Nominal Voltage)

25. Perform the following DSKY operations:

- a. VERB 87 ENTR  
b. Observe VERB 21 NOUN 01 Flashing ENTR  
c. 00004  
d. Observe VERB 16 NOUN 20 Displayed ENTR  
e. VERB 34

26. In approximately 12 minutes VERB 06 and NOUN 66 will flash. Local gravity as measured by X, Y, and Z PIPA will be displayed in Row 1 and Row 2. Record indications.

27. Enter VERB 33 and press ENTR pushbutton on the DSKY.

28. When VERB 06 and NOUN 66 flash the horizontal component of earth rate on the X, Y and Z IRIGs will be displayed in Row 2. Record indication.

29. Connect the input bus to the Digital Voltmeter (DVM) by setting the CROSBAR CONTROL on the Primary Signal Selector panel to 173.

30. Adjust the G & N POWER ADJUST control on the Test Control panel until the DVM indicates input bus voltage of 24.5 (+0.25, -0) vdc. Record indication. PIPA AND IRIG TEST (Low Voltage)

31. Enter VERB 36 and press the ENTR pushbutton on the DSKY.

32. Repeat steps 23 through 28.

33. Connect the input bus to the Digital Voltmeter (DVM) by setting the CROSBAR CONTROL on the Primary Signal Selector panel to 173.

34. Adjust the G & N POWER ADJUST control on the Test Control panel until the DVM indicates an input bus voltage of 32.5 (+0.25, -0) vdc. Record indication.

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PIPA AND IRIG TEST (High Voltage)  
35. Enter VERB 36 and press the ENTR pushbutton on the DSKY.

36. Repeat steps 23 through 28.

37. Enter VERB 36 and press the ENTR pushbutton on the DSKY.

38. Connect the input bus to the Digital Voltmeter (DVM) by setting the CROSBAR CONTROL on the Primary Signal Selector panel to 173.

39. Adjust the G & N POWER ADJUST control on the Test Control panel until the DVM indicates an input bus voltage of 28.0 (+0.25) vdc.

Horizontal Earth Rate Tolerances		
LOCATION	MIN VALUE	MAX VALUE
MIT	00000.54000	00000.84000
AC	00000.54000	00000.84000
MSC	00000.76000	00000.91000
NAA	00000.70000	00000.90000
MILA	00000.79000	00000.91000
GAEC	00000.65750	00000.85750

Table 1

DATE 15 MAR 66

APOLLO G&N  
EQUIPMENT TEST  
DATA SHEET 1 OF 2

JOB G & N SYSTEM OPERATIONAL TEST

JDC  
NO. 12617  
REV. F  
INITIAL TDRR 27 134

ASSEMBLY UNDER TEST				TEST HISTORY			
TITLE		DATE		TIME		SITE / LOCATION	
SER. NO.	DWG	REV.	START	END	START	END	TOTAL ELAPSED
MAJOR GROUND SUPPORT EQUIPMENT							
NAME		SER. NO.		SER. NO.		CAL DATE	
NAME		SER. NO.		SER. NO.		CAL DATE	
CONDUCTED BY NAME/AFFILIATION APPROVED BY NAME/AFFILIATION							
JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
1 thru 18	Displays	All DSKY character and condition lamps performed as required					
22	IMU 28 vdc Bus	vdc	27.75		28.25		
26	gravity	cm/sec <sup>2</sup>	975.0	R1 R2	985.9		
28	Horizontal earth rate (R2)	ERU	See Table 1		See Table 1		
30	IMU 28 vdc Bus	vdc	24.5		24.75		
32(26)	gravity	cm/sec <sup>2</sup>	975.0		985.9		
32(28)	Horizontal earth rate (R2)	ERU	See Table 1		See Table 1		
34	IMU 28 vdc Bus	vdc	32.5		32.75		
36(26)	gravity	cm/sec <sup>2</sup>	975.0		985.9		

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APOLLO G&N  
EQUIPMENT TEST

DATA SHEET 2 OF 2

JOB G & N SYSTEM OPERATIONAL TEST

JDC  
NO. 12617  
REV. F

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
36 (28)	Horizontal earth rate (R2)	ERU	See Table 1		See Table 1		
COMMENTS							

DATE 15 MAR 66

SUBSYSTEM LEM G & N SYSTEM				ASSY
DESCRIPTION The purpose of this test is to check gross G & N System operation. Computer-DSKY interface is checked by performing a computer controlled DSKY test which verifies correct DSKY character displays. A manual DSKY keyboard test is performed to verify correct key-character display operation. An alarm and interrupts test checks computer program error sensing capabilities. Finally a computer controlled test of PIPA and IRIG operation is performed with OG, IG and MG at 45 degrees. In this position each PIPA is sensing some portion of positive g and the accumulative PIPA				
Rev	Date	TORR	PAGES REVISED	APPROVAL REFERENCES
A	2-25-66	28177	2-5	ALL MMS ACKM
B	7-21-66	30272	3-4	EA MB
C	8-4-66	30519	2-5	1 EA
D	10-20-66	31617	1	EA
E	2-2-67	32855	1-5	EA
F	7-27-67	34232	1	EA
G	8-31-67	34457	3-4,5	1 EA
				TOOLS AND MATERIAL

DESCRIPTION (Cont)  
measurement should be the value of local g. IRIG performance is checked by measuring the effect of the horizontal component of earth rate (cos x) in the same orientation. The IRIG and PIPA test is performed at normal, low and high prime power levels with the LGC Self Check being performed concurrently.

IMPORTANT: 1. Obtain the time of day of high order scalar overflow from JDC 12614. To prevent erroneous test results, do not enter a PIPA and IRIG Test within 0.2 hours of that time.

2. Insure that connector assembly (2003099) is removed and W226-P1 is connected to the LGC test connector before proceeding with this JDC.

#### INITIALIZATION

1. Insure that the system is in ISS STANDBY with the Computer operating and the CGC/LGC POWER ON and 400 CPFS POWER ON pushbuttons on the Test Control panel are lighted.

VERIFICATION WITH SID REQUIRED BEFORE USE

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FOR JDC 12617  
CH. 2-5-66

6. Observe that Row 1 contains +12345 and that Row 2 contains -67890.  
7. Press CLR pushbutton twice on DSKY. Observe that Row 1 and Row 2 are blank.

#### ALARM AND INTERRUPT TEST

##### PARITY FAIL TEST

8. Perform the following DSKY operations:

- |                    |          |
|--------------------|----------|
| a. VERB 57         | ENTR     |
| b. 00015           | ENTR     |
| c. VERB 21         | NOUN 02  |
| d. Observe VERB 21 | ENTR     |
| e. 01600           | Flashing |
| f. Observe VERB 21 | ENTR     |
| g. 33777           | ENTR     |
| h. VERB 25         | NOUN 26  |
| i. Observe VERB 21 | ENTR     |
| j. 04000           | ENTR     |
| k. Observe VERB 22 | ENTR     |
| l. 01600           | ENTR     |
| m. Observe VERB 23 | ENTR     |
| n. 00003           | ENTR     |
| o. VERB 30         | ENTR     |

9. Verify that the RESTART condition lamp on the DSKY, and the G/N CAUTION lamp on the Monitor panel are lighted. VERB 05 and VERB 06 and NOUN 31 shall be displayed and Rows 1, 2, and 3 shall indicate 00000 on the DSKY.

10. Press RESET pushbutton on the

DSKY. Enter VERB 36 and press the ENTR pushbutton on the DSKY.

#### RUPT LOCK

11. Perform the following DSKY operations:

- |                    |         |          |
|--------------------|---------|----------|
| a. VERB 24         | NOUN 01 | ENTR     |
| b. Observe VERB 24 | NOUN 01 | Flashing |
| c. 01600           | ENTR    |          |
| d. VERB 21         | NOUN 01 | Flashing |
| e. 30001           | ENTR    |          |
| f. Observe VERB 22 | NOUN 01 | Flashing |
| g. 01600           | ENTR    |          |
| h. VERB 25         | NOUN 26 | ENTR     |
| i. Observe VERB 21 | NOUN 26 | Flashing |
| j. 00001           | ENTR    |          |
| k. Observe VERB 22 | NOUN 26 | Flashing |
| l. 01600           | ENTR    |          |
| m. Observe VERB 23 | NOUN 26 | Flashing |
| n. 00003           | ENTR    |          |
| o. VERB 31         | ENTR    |          |

12. Verify that the RESTART condition lamp on the DSKY and the G/N CAUTION lamp on the Monitor panel are lighted. VERB 05 and NOUN 31 shall be displayed and Rows 1, 2 and 3 shall indicate 00000 on the MAIN DSKY.

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#### DSKY CHECK

2. Perform the following DSKY operations:  
VERB 21 NOUN 27 ENTR  
00011

3. Observe that all 9's are displayed in the PROG, VERB, NOUN and Row 1, Row 2, Row 3 character positions. Check that all applicable electroluminescent elements are lighted. Including the 9's, the following shall be displayed for approximately 5 seconds.

- |        |
|--------|
| a. 9's |
| b. 8's |
| c. 7's |
| d. 6's |
| e. 5's |
| f. 4's |
| g. 3's |
| h. 2's |
| i. 1's |

j. 0's

k. Minus signs in Row 1, on concurrently

ROW 2, ROW 3 for 5 seconds

l. VERB-NOUN Flashing

m. COMP ACTY

n. Plus signs in Row 1, on currently

ROW 2, ROW 3 for 5 seconds

p. VERB-NOUN Flashing

q. COMP ACTY

r. COMP ACTY on for 5 sec-

onds then

DSKY blanks

4. Enter VERB 35 and press the ENTR

pushbutton on the MAIN DSKY. The following DSKY displays shall illuminate for 5 seconds.

- |   |
|---|
| a. UPLINK ACTY                          |
| b. NO ATT                               |
| c. STBY                                 |
| d. KEY REL Flashing                     |
| e. TEMP                                 |
| f. GIMBAL LOCK                          |
| g. PROG                                 |
| h. RESTART                              |
| i. TRACKER                              |
| j. OPR ERROR Flashing                   |
| k. VERB-NOUN Flashing                   |
| l. Plus 88888 in Row 1, ROW 2 and ROW 3 |

on concurrently for 5 seconds

After indications a through l go out, plus 88888's shall remain on Row 1, Row 2 and Row 3.

#### MANUAL DSKY OPERATION CHECK

5. Perform the following DSKY operations:

- |                    |              |          |
|--------------------|--------------|----------|
| a. VERB 24         | NOUN 01      | ENTR     |
| b. Observe VERB 24 | NOUN 01      | Flashing |
| c. 01700           | ENTR         |          |
| d. Observe VERB 21 | NOUN 01      | Flashing |
| e. +12345          | ENTR         |          |
| f. Observe VERB 22 | NOUN 01      | Flashing |
| g. -67890          | Do NOT press | ENTR     |

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13. Press RESET pushbutton on the DSKY. Enter VERB 36 and press the ENTR pushbutton on the DSKY.

#### TC TRAP TEST

14. Perform the following DSKY operations:

- |                    |         |          |
|--------------------|---------|----------|
| a. VERB 21         | NOUN 02 | ENTR     |
| b. Observe VERB 21 | NOUN 02 | Flashing |
| c. 01600           | ENTR    |          |
| d. Observe VERB 21 | NOUN 02 | Flashing |
| e. 01600           | ENTR    |          |
| f. VERB 25         | NOUN 26 | ENTR     |
| g. Observe VERB 21 | NOUN 26 | Flashing |
| h. 04000           | ENTR    |          |
| i. Observe VERB 22 | NOUN 26 | Flashing |
| j. 01600           | ENTR    |          |
| k. Observe VERB 23 | NOUN 26 | Flashing |
| l. 00003           | ENTR    |          |
| m. VERB 30         | ENTR    |          |

15. Verify that the RESTART condition lamp on the DSKY, and the G/N CAUTION lamp on the Monitor panel are lighted. VERB 05 and NOUN 31 shall be displayed and Rows 1, 2 and 3 shall indicate 00000 on the MAIN DSKY.

16. Press RESET pushbutton on the DSKY. Enter VERB 36 and press the ENTR pushbutton on the DSKY.

#### NIGHT WATCHMAN TEST

17. Perform the following MAIN DSKY operations:

- |                    |         |          |
|--------------------|---------|----------|
| a. VERB 24         | NOUN 01 | ENTR     |
| b. Observe VERB 24 | NOUN 01 | Flashing |
| c. 01600           | ENTR    |          |
| d. Observe VERB 21 | NOUN 01 | Flashing |
| e. 30001           | ENTR    |          |
| f. Observe VERB 22 | NOUN 01 | Flashing |
| g. 01600           | ENTR    |          |
| h. VERB 25         | NOUN 26 | ENTR     |
| i. Observe VERB 21 | NOUN 26 | Flashing |
| j. 03400           | ENTR    |          |
| k. Observe VERB 22 | NOUN 26 | Flashing |
| l. 01600           | ENTR    |          |
| m. Observe VERB 23 | NOUN 26 | Flashing |
| n. 00003           | ENTR    |          |
| o. VERB 30         | ENTR    |          |

18. Verify that the RESTART condition lamp on the DSKY and the G/N CAUTION lamp on the Monitor panel are lighted. VERB 05 and NOUN 31 shall be displayed and Rows 1, 2 and 3 shall indicate 00000 on the MAIN DSKY.

19. Press RESET pushbutton on DSKY. Enter VERB 36 and press the ENTR pushbutton on the DSKY.

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SUBSYSTEM LEM G & N SYSTEM

ASSY

IRIG AND PIPA TEST INITIALIZATION  
20. Press ISS OPERATE pushbutton on the Test Control panel.  
21. Connect the input bus to the Digital Voltmeter (DVM) by setting the CROSSEBAR CONTROL on the Primary Signal Selector panel to 173.  
22. Adjust the G & N POWER ADJUST control on the Test Control panel until the DVM indicates an input bus voltage of 28.0 (+0.25) vdc. Record indication.  
23. Perform the following DSKY operations:  
a. VERB 21 NOUN 27 ENTR  
b. Observe VERB 21 NOUN 27 Flashing  
c. 77767 ENTR  
Allow test to run 5 minutes. Record any failures indicated by VERB 06 NOUN 31 being displayed on DSKY's. If no failure occurs, write "None" on data sheet.  
24. Insure that at least 90 seconds have elapsed since performing Step 20 and that the PIPA loops have closed as indicated by a butterfly pattern on the PIPA monitor scope of the OIA.  
PIPA AND IRIG TEST (Nominal Voltage)  
25. Perform the following DSKY operations:  
a. VERB 57 ENTR  
b. Observe VERB 21 NOUN 01 Flashing  
c. 00004 ENTR

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SUBSYSTEM LEM G & N SYSTEM

ASSY

PIPA AND IRIG TEST (High Voltage)  
35. Enter VERB 36 and press the ENTR pushbutton on the DSKY.  
36. Repeat steps 23 through 28.  
37. Enter VERB 36 and press the ENTR pushbutton on the DSKY.  
38. Connect the input bus to the Digital Voltmeter (DVM) by setting the CROSSEBAR CONTROL on the Primary Signal Selector panel to 173.  
39. Adjust the G & N POWER ADJUST control on the Test Control panel until the DVM indicates an input bus voltage of 28.0 (+0.25) vdc.

Horizontal Earth Rate Tolerances		
LOCATION	MIN VALUE	MAX VALUE
MIT	00000.64000	00000.84000
AC	00000.64000	00000.84000
MSC	00000.76000	00000.91000
NAA	00000.70000	00000.90000
MILA	00000.79000	00000.91000
GAEC	00000.65750	00000.85750

Table 1

APOLLO 88N  
EQUIPMENT TEST  
DATA SHEET 1 OF 2

JOB G & N SYSTEM OPERATIONAL TEST

JDC NO. 12617  
REV G  
INITIAL TDRR 27134

ASSEMBLY UNDER TEST			TEST HISTORY		
TITLE	DATE	START	END	SITE / LOCATION	
SER. NO.	DWG	REV.	TIME	START	END
MAJOR GROUND SUPPORT EQUIPMENT					
NAME	SER. NO.	SER. NO.	CAL DATE		
NAME	SER. NO.	SER. NO.	CAL DATE		
CONDUCTED BY NAME/AFFILIATION APPROVED BY NAME/AFFILIATION					
JDC ITEM NO.	PARAMETER	UNITS	RECORDED VALUE	MIN VALUE	MAX VALUE
1 thru 18	Displays	All DSKY character and condition lamps performed as required			
22	IMU 28 vdc Bus	vdc	27.75	27.75	28.25
23	LGC self check failures				
26	gravity	cm/sec <sup>2</sup>	975.0	R1	R2
28	Horizontal earth rate (R2)	ERU	See Table 1	See Table 1	See Table 1
30	IMU 28 vdc Bus	vdc	24.5	24.75	24.75
32(26)	gravity	cm/sec <sup>2</sup>	975.0	985.9	985.9
32(26)	Horizontal earth rate (R2)	ERU	See Table 1	See Table 1	See Table 1
34	IMU 28 vdc Bus	vdc	32.5	32.75	32.75
36(26)	gravity	cm/sec <sup>2</sup>	975.0	985.9	985.9

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APOLLO 88N  
EQUIPMENT TEST  
DATA SHEET 2 OF 2

JOB G & N SYSTEM OPERATIONAL TEST

JDC NO. 12617  
REV G

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ ACC
36(26)	Horizontal earth rate (R2)	ERU	See Table 1		See Table 1	
COMMENTS						

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SUBSYSTEM LEM G & N SYSTEM

ASSY

**DESCRIPTION** The purpose of this test is to check gross G & N System operation. Computer-DSKY interface is checked by performing a computer controlled DSKY test which verifies correct DSKY character display operation. A manual DSKY keyboard test is performed to verify correct key-character display operation. An alarm and Interrupts Test checks computer program error sensing capabilities. Finally a computer controlled test of PIPA and IRIG operation is performed with OC, IG and MG at 45 degrees. In this position each PIPA 1A is sensing some portion of positive g and the accumulative PIPA

Rev.	Date	TORR NO.	PAGES REVISED	APPROVAL	REFERENCES
A)	8-25-66	28177	2-5	ALL	MMB ACMA
B)	7-21-66	30272	3-4	-	EA MB
C)	8-4-66	30519	2-5	1	EA MB
D)	10-20-68	31617	1	-	EA MB
E)	2-2-67	32885	1.5	-	EA MB
F)	7-27-67	34232	1	-	EA MB
G)	8-31-67	34457	3-4.5	1	EA MB
H)	11-20-67	35185	1,3,5	1	EA MB
					TOOLS AND MATERIAL

**DESCRIPTION (Cont)**  
measurement should be the value of local g. IRIG performance is checked by measuring the effect of the horizontal component of earth rate (cos x) in the same orientation. The IRIG and PIPA test is performed at normal, low and high prime power levels with the LOC Self Check being performed concurrently.

**IMPORTANT:** 1. Obtain the time of day of high order scaler overflow from JDC 12614. To prevent erroneous test results, do not enter a PIPA and IRIG Test within 0.2 hours of that time.

2. Insure that connector assembly (2003099) is connected to the LGC test connector.  
**INITIALIZATION**  
1. Insure that the system is in ISS STANDBY with the Computer operating and the GGC/LGC POWER ON and 400 CPS POWER ON pushbuttons on the Test Control panel are lighted.

VERIFICATION WITH SIDL REQUIRED BEFORE USE

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FORM 100-1  
CIG 3-5-66

ASSY

6. Observe that Row 1 contains +12345 and that Row 2 contains -67890.  
7. Press CLR pushbutton twice on DSKY. Observe that Row 1 and Row 2 are blank.  
**ALARM AND INTERRUPT TEST**  
**PARITY FAIL TEST**  
8. Perform the following DSKY operations:  
a. VERB 57 ENTR  
b. 00015 ENTR  
c. VERB 27 NOUN 01 ENTR  
d. Observe VERB 31 NOUN 01 Flashing  
e. 70000 ENTR  
9. Verify that the RESTART condition lamp on the DSKY, and the G/N CAUTION lamp on the Monitor panel are lighted. VERB 06 and VERB 05 and NOUN 31 shall be displayed and Rows 1, 2, and 3 shall indicate 00000 on the DSKY.  
10. Press RESET pushbutton on the DSKY. Enter VERB 36 and press the ENTR pushbutton on the DSKY.  
**RUPT LOCK**  
11. Perform the following DSKY operations:  
a. VERB 24 NOUN 01 ENTR

12. Verify that the RESTART condition lamp on the DSKY and the G/N CAUTION lamp on the Monitor panel are lighted. VERB 06 and NOUN 31 shall be displayed and Rows 1, 2 and 3 shall indicate 00000 on the MAIN DSKY.

DATE 15 MAR 66

ASSY

**DSKY CHECK**

2. Perform the following DSKY operations:  
VERB 21 NOUN 27 ENTR  
00011 ENTR  
3. Observe that all 9's are displayed in the PROG, VERB, NOUN and Row 1, Row 2, Row 3 character positions. Check that all applicable electroluminescent elements are lighted, including the 9's, the following shall be displayed for approximately 5 seconds.

- a. 9's
- b. 8's
- c. 7's
- d. 6's
- e. 5's
- f. 4's
- g. 3's
- h. 2's
- i. 1's

- a. UPLINK ACTY
- b. NO ATT
- c. STBY
- d. KEY REL Flashing
- e. TEMP
- f. GIMBAL LOCK
- g. PROG
- h. RESTART
- i. TRACKER
- j. OPR ERROR Flashing
- k. VERB-NOUN Flashing
- l. Plus 88888 in ROW 1, ROW 2 and ROW 3

on concurrently for 5 seconds

After indications a through l go out, plus 88888's shall remain on ROW 1, ROW 2 and ROW 3.

**MANUAL DSKY OPERATION CHECK**

- 5. Perform the following DSKY operations:  
a. VERB 24 NOUN 01 ENTR  
b. Observe VERB 24 NOUN 01 Flashing  
c. 01700 ENTR  
d. Observe VERB 21 NOUN 01 Flashing  
e. +12345 ENTR  
f. Observe VERB 22 NOUN 01 Flashing  
g. -67890 Do NOT press ENTR

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ASSY

13. Press RESET pushbutton on the DSKY. Enter VERB 36 and press the ENTR pushbutton on the DSKY.

**TC TRAP TEST**

14. Perform the following DSKY operations:

- a. VERB 21 NOUN 03 ENTR
- b. Observe VERB 21 NOUN 03 Flashing
- c. 01600 ENTR
- d. Observe VERB 21 NOUN 03 Flashing
- e. 01600 ENTR
- f. VERB 25 NOUN 26 ENTR
- g. VERB 21 NOUN 26 Flashing
- h. 04000 ENTR
- i. Observe VERB 22 NOUN 26 Flashing
- j. 01600 ENTR
- k. Observe VERB 23 NOUN 26 Flashing
- l. 00003 ENTR
- m. VERB 30 ENTR

15. Verify that the RESTART condition lamp on the DSKY, and the G/N CAUTION lamp on the Monitor panel are lighted. VERB 05 and NOUN 31 shall be displayed and Rows 1, 2 and 3 shall indicate 00000 on the MAIN DSKY.

16. Press RESET pushbutton on the DSKY. Enter VERB 36 and press the ENTR pushbutton on the DSKY.

**NIGHT WATCHMAN TEST**

17. Perform the following MAIN DSKY operations:

- a. VERB 24 NOUN 01 ENTR
- b. Observe VERB 24 NOUN 01 Flashing
- c. 01600 ENTR
- d. Observe VERB 21 NOUN 01 Flashing
- e. 30001 ENTR
- f. Observe VERB 22 NOUN 01 Flashing
- g. 01600 ENTR
- h. VERB 25 NOUN 26 ENTR
- i. Observe VERB 21 NOUN 26 Flashing
- j. 03400 ENTR
- k. Observe VERB 22 NOUN 26 Flashing
- l. 01600 ENTR
- m. Observe VERB 23 NOUN 26 Flashing
- n. 00003 ENTR
- o. VERB 30 ENTR

18. Verify that the RESTART condition lamp on the DSKY and the G/N CAUTION lamp on the Monitor panel are lighted. VERB 05 and NOUN 31 shall be displayed and Rows 1, 2 and 3 shall indicate 00000 on the MAIN DSKY.

19. Press RESET pushbutton on DSKY. Enter VERB 36 and press the ENTR pushbutton on the DSKY.

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SUBSYSTEM LEM G & N SYSTEM

ASSY

IRIG AND PIPA TEST INITIALIZATION  
20. Press ISS OPERATE pushbutton on the Test Control panel.  
21. Connect the input bus to the Digital Voltmeter (DVM) by setting the CROSSBAR CONTROL on the Primary Signal Selector panel to 173.  
22. Adjust the G & N POWER ADJUST control on the Test Control panel until the DVM indicates an input bus voltage of 28.0 (+0.25) vdc. Record indication.  
LOC SELF CHECK  
23. Perform the following DSKY operations:  
a. VERB 21 NOUN 27 ENTR  
b. Observe VERB 21 NOUN 27 Flashing  
c. 77767  
Allow test to run 5 minutes. Record any failures indicated by VERB 06 NOUN 31 being displayed on DSKY's. If no failure occurs, write "None" on data sheet.  
24. Insure that at least 90 seconds have elapsed since performing Step 20 and that the PIPA loops have closed as indicated by a butterfly pattern on the PIPA monitor scope of the OIA.  
PIPA AND IRIG TEST (Nominal Voltage)  
25. Perform the following DSKY operations:  
a. VERB 57 ENTR  
b. Observe VERB 21 NOUN 01 Flashing  
c. 00004

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SUBSYSTEM LEM G & N SYSTEM

ASSY

PIPA AND IRIG TEST (High Voltage)  
35. Enter VERB 36 and press the ENTR pushbutton on the DSKY.  
36. Repeat steps 23 through 28.  
37. Enter VERB 36 and press the ENTR pushbutton on the DSKY.  
38. Connect the input bus to the Digital Voltmeter (DVM) by setting the CROSSBAR CONTROL on the Primary Signal Selector panel to 173.  
39. Adjust the G & N POWER ADJUST control on the Test Control panel until the DVM indicates an input bus voltage of 28.0 (+0.25) vdc.

Horizontal Earth Rate Tolerances		
LOCATION	MIN VALUE	MAX VALUE
MIT	00000.64000	00000.84000
AC	00000.64000	00000.84000
MSC	00000.76000	00000.91000
NAA	00000.70000	00000.90000
MILA	00000.79000	00000.91000
GAEC	00000.85750	00000.85750

Table 1

DATE 15 MAR 66

APOLLO G&N  
EQUIPMENT TEST  
DATA SHEET 1 OF 2

JOB G & N SYSTEM OPERATIONAL TEST

JDC  
NO. 12617  
REV H  
INITIAL TDRR 27114

ASSEMBLY UNDER TEST		TEST HISTORY				
TITLE	DATE	START	END			
SER. NO.	DWG	REV.	SITE / LOCATION			
TIME START						
END						
TOTAL ELAPSE						
MAJOR GROUND SUPPORT EQUIPMENT						
NAME	SER. NO.	CAL DATE				
NAME	SER. NO.	CAL DATE				
CONDUCTED BY						
APPROVED BY						
NAME/AFFILIATION						
JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ ACC
1 thru 18	Displays	All DSKY character and condition lamps performed as required				
22	IMU 28 vdc Bus	vdc	27.75		28.25	
23	LGC self check failures					
26	gravity	cm/sec <sup>2</sup>	975.0		985.9	
28	Horizontal earth rate (R2)	ERU	See Table 1		See Table 1	
30	IMU 28 vdc Bus	vdc	24.5		24.75	
32(23)	LGC self check failures					
32(26)	gravity	cm/sec <sup>2</sup>	975.0		985.9	
32(28)	Horizontal earth rate (R2)	ERU	See Table 1		See Table 1	

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APOLLO G&N  
EQUIPMENT TEST  
DATA SHEET 2 OF 2

JOB G & N SYSTEM OPERATIONAL TEST

JDC  
NO. 12617  
REV H

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ ACC
34	IMU 28 vdc Bus	vdc	32.8		32.75	
36(23)	LGC self check failures					
36(26)	gravity	cm/sec <sup>2</sup>	975.0		985.9	
36(28)	Horizontal earth rate (R2)	ERU	See Table 1		See Table 1	
COMMENTS						

DATE 15 MAR 66  
FORM 00147  
Chg. 8-39-66



SUBSYSTEM LEM G & N SYSTEM				ASSY.		
DESCRIPTION The purpose of this test is to check gross G & N System operation. Computer-DSKY interface is checked by performing a computer controlled DSKY test which verifies correct DSKY character displays. A manual DSKY keyboard test is performed to verify correct key-character display operation. An alarm and interrupts Test checks computer program error sensing capabilities. Finally a computer controlled test of PIPA and IRIG operation is performed with OG, IG and MG at 45 degrees. In this position each PIPA <sub>A</sub> is sending some portion of positive g and the accumulative PIPA						
Rev.	Date	TORR NO.	PAGES REVISED		APPROVAL	REFERENCES
			JDC	D.S.		
A	8-25-66	28177	2-5	All	MMB	ACMB
B	7-21-66	30272	3,4	-	EA	MMB
C	8-4-66	30519	2,5	1	EA	MMB
D	10-20-66	31617	1	-	EA	MMB
E	2-2-67	32865	1,5	-	EA	MMB
F	7-27-67	34232	1	-	EA	MMB
G	8-31-67	34457	3,4,5	1	EA	MMB
H	11-30-67	35185	1,3,5	1	EA	MMB
J	11-11-68	35386	3	All	EA	MMB
						IMPORTANT See below.
						INTERVAL
						TOOLS AND MATERIAL

DESCRIPTION (Cont)  
measurement should be the value of local g. IRIG performance is checked by measuring the effect of the horizontal component of earth rate (cos  $\lambda$ ) in the same orientation. The IRIG and PIPA test is performed at normal, low and high prime power levels with the LGC Self Check being performed concurrently.

IMPORTANT: 1. Obtain the time of day of high order scaler overflow from JDC 12614. To prevent erroneous test results, do not enter a PIPA and IRIG Test within 0.2 hours of that time.

2. Insure that connector assembly (2003099) is connected to the LGC test connector.

#### INITIALIZATION

1. Insure that the system is in ISS STANDBY with the Computer operating and the CGC/LGC POWER ON and 400 CP3 POWER ON pushbuttons on the Test Control panel are lighted.

VERIFICATION WITH SIDL REQUIRED BEFORE USE

DATE 15 MAR 66

FOR 4 0013A  
Chg. 3-4-66

SUBSYSTEM LEM G & N SYSTEM

ASSY

DSKY CHECK

2. Perform the following DSKY operations:

VERB 21 NOUN 27 ENTR

00011

ENTR

3. Observe that all 9's are displayed in the PROG, VERB, NOUN and Row 1, Row 2, Row 3 character positions. Check that all applicable electroluminescent elements are lighted. Including the 9's, the following shall be displayed for approximately 5 seconds.

a. 9's

b. 8's

c. 7's

d. 6's

e. 5's

f. 4's

g. 3's

h. 2's

i. 1's

j. 0's

k. Minus signs in ROW 1, on concurrently for 5 seconds  
ROW 2, ROW 3

l. VERB-NOUN Flashing

m. COMP ACTY

n. Plus signs in ROW 1,

ROW 2, ROW 3

o. VERB-NOUN Flashing on currently for 5 seconds

p. COMP ACTY

q. COMP ACTY

r. COMP ACTY on for 5 seconds then DSKY blanks

4. Enter VERB 35 and press the ENTR

pushbutton on the MAIN DSKY. The following DSKY displays shall illuminate for 5 seconds.

a. UPLINK ACTY

b. NO ATT

c. STBY

d. KEY REL Flashing

e. TEMP

f. GIMBAL LOCK

g. PROG

h. RESTART

i. TRACKER

j. OPR ERROR Flashing

k. VERB-NOUN Flashing

l. Plus 88888 in ROW 1,  
ROW 2 and ROW 3

on concurrently  
for 5 seconds

After indications a through l go out, plus 88888's shall remain on ROW 1, ROW 2 and ROW 3.

MANUAL DSKY OPERATION CHECK

5. Perform the following DSKY operations:

a. VERB 24 NOUN 01 ENTR

b. Observe

c. VERB 24 NOUN 01 Flashing

c. 01700 ENTR

d. Observe

VERB 21 NOUN 01

e. +12345 Flashing

f. Observe

VERB 22

NOUN 01

Do NOT press ENTR

g. -47890

After indications a through i go out, plus 88888's shall remain on ROW 1, ROW 2 and ROW 3.

#### MANUAL DSKY OPERATION CHECK

5. Perform the following DSKY operations:

a. VERB 24	NOUN 01	ENTR
b. Observe VERB 24	NOUN 01	Flashing
c. 01700		ENTR
d. Observe VERB 21	NOUN 01	Flashing
e. +12345		ENTR
f. Observe VERB 22	NOUN 01	Flashing
g. -47890		Do NOT press ENTR

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SUBSYSTEM LEM G & N SYSTEM				ASSY
8. Observe that Row 1 contains +12345 and that Row 2 contains -67890.				
7. Press CLR pushbutton twice on DSKY. Observe that Row 1 and Row 2 are blank.				
<u>ALARM AND INTERRUPT TEST</u>				
<u>PARITY FAIL TEST</u>				
9. Perform the following DSKY operations:				
a. VERB 36		ENTR		Flashing ENTR
b. VERB 27	NOUN 01	ENTR		Flashing ENTR
c. Observe VERB 27	NOUN 01	Flashing		Flashing ENTR
d. 70000		ENTR		Flashing ENTR
9. Verify that the RESTART condition lamp on the DSKY, and the G/N CAUTION lamp on the Monitor panel are lighted. VERB 06 and NOUN 31 shall be displayed and Rows 1, 2, and 3 shall indicate 00000 on the DSKY.				
10. Press RESET pushbutton on the DSKY. Enter VERB 36 and press the ENTR pushbutton on the DSKY.				
<u>RUPT LOCK</u>				
11. Perform the following DSKY operations:				
a. VERB 24	NOUN 01	ENTR		Flashing ENTR

b. Observe VERB 24	NOUN 01	Flashing ENTR
e. 01600		
d. Observe VERB 21	NOUN 01	Flashing ENTR
e. 30001		
f. Observe VERB 22	NOUN 01	Flashing ENTR
g. 01600		
h. VERB 25	NOUN 26	ENTR
i. Observe VERB 21	NOUN 26	Flashing ENTR
j. 00001		
k. Observe VERB 22	NOUN 26	Flashing ENTR
l. 01600		
m. Observe VERB 23	NOUN 26	Flashing ENTR
n. 00003		
o. VERB 31		ENTR

12. Verify that the RESTART condition lamp on the DSKY and the G/N CAUTION lamp on the Monitor panel are lighted. VERB 06 and NOUN 31 shall be displayed and Rows 1, 2 and 3 shall indicate 00000 on the MAIN DSKY.	
---	--

DATE 15 MAR 66

SUBSYSTEM LEM G & N SYSTEM				ASSY
NIGHT WATCHMAN TEST				
17. Perform the following MAIN DSKY operations:				
a. VERB 24	NOUN 01	ENTR		
b. Observe VERB 24	NOUN 01	Flashing		
c. 01600		ENTR		
d. Observe VERB 21	NOUN 01	Flashing		
e. 30001		ENTR		
f. Observe VERB 22	NOUN 01	Flashing		
g. 01600		ENTR		
h. VERB 25	NOUN 26	ENTR		
i. Observe VERB 21	NOUN 26	Flashing		
j. 03400		ENTR		
k. Observe VERB 22	NOUN 26	Flashing		
l. 01600		ENTR		
m. Observe VERB 23	NOUN 26	Flashing		
n. 00003		ENTR		
o. VERB 30		ENTR		
18. Verify that the RESTART condition lamp on the DSKY and the G/N CAUTION lamp on the Monitor panel are lighted. VERB 05 and NOUN 31 shall be displayed and Rows 1, 2 and 3 shall indicate 00000 on the MAIN DSKY.				
19. Press RESET pushbutton on DSKY. Enter VERB 36 and press the ENTR pushbutton on the DSKY.				

13. Press RESET pushbutton on the DSKY. Enter VERB 36 and press the ENTR pushbutton on the DSKY.				
TC TRAP TEST				
14. Perform the following DSKY operations:				
a. VERB 21	NOUN 03	ENTR		
b. Observe VERB 21	NOUN 03	Flashing		
c. 01600		ENTR		
d. Observe VERB 21	NOUN 03	Flashing		
e. 01600		ENTR		
f. VERB 25	NOUN 26	ENTR		
g. Observe VERB 21	NOUN 26	Flashing		
h. 04000		ENTR		
i. Observe VERB 22	NOUN 26	Flashing		
j. 01600		ENTR		
k. Observe VERB 23	NOUN 26	Flashing		
l. 00003		ENTR		
m. VERB 30		ENTR		
15. Verify that the RESTART condition lamp on the DSKY, and the G/N CAUTION lamp on the Monitor panel are lighted. VERB 06 and NOUN 31 shall be displayed and Rows 1, 2 and 3 shall indicate 00000 on the MAIN DSKY.				
16. Press RESET pushbutton on the DSKY. Enter VERB 36 and press the ENTR pushbutton on the DSKY.				

#### NIGHT WATCHMAN TEST

17. Perform the following MAIN DSKY operations:

a. VERB 24	NOUN 01	ENTR
b. Observe VERB 24	NOUN 01	Flashing
c. 01600		ENTR
d. Observe VERB 21	NOUN 01	Flashing
e. 30001		ENTR
f. Observe VERB 22	NOUN 01	Flashing
g. 01600		ENTR
h. VERB 26	NOUN 26	ENTR
i. Observe VERB 21	NOUN 26	Flashing
j. 03400		ENTR
k. Observe VERB 22	NOUN 26	Flashing
l. 01600		ENTR
m. Observe VERB 23	NOUN 26	Flashing
n. 00003		ENTR
o. VERB 30		ENTR

18. Verify that the RESTART condition lamp on the DSKY and the G/N CAUTION lamp on the Monitor panel are lighted. VERB 06 and NOUN 31 shall be displayed and Rows 1, 2 and 3 shall indicate 00000 on the MAIN DSKY.

19. Press RESET pushbutton on DSKY. Enter VERB 36 and press the ENTR pushbutton on the DSKY.

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JOB G & N SYSTEM OPERATIONAL TEST		JDC 12617	REV J	PAGE 5 OF 6
SUBSYSTEM LEM G & N SYSTEM		ASSY		
IRIG AND PIPA TEST INITIALIZATION				
20. Press ES OPERATE pushbutton on the Test Control panel.				
21. Connect the input bus to the Digital Voltmeter (DVM) by setting the CROSSBAR CONTROL on the Primary Signal Selector panel to 173.				
22. Adjust the G & N POWER ADJUST control on the Test Control panel until the DVM indicates an input bus voltage of 28.0 (+0.25) vdc. Record indication.				
LGC SELF CHECK				
23. Perform the following DSKY operations:				
a. VERB 21 NOUN 27 ENTR				
b. Observe VERB 21 NOUN 27 Flashing ENTR				
c. 77767				
Allow test to run 5 minutes. Record any failures indicated by VERB 05 NOUN 31 being displayed on DSKY's. If no failure occurs, write "None" on data sheet.				
24. Insure that at least 90 seconds have elapsed since performing Step 20 and that the PIPA loops have closed as indicated by a butterfly pattern on the PIPA monitor scope of the OIA.				
PIPA AND IRIG TEST (Nominal Voltage)				
25. Perform the following DSKY operations:				
a. VERB 57 ENTR				
b. Observe VERB 21 NOUN 01 Flashing ENTR				
c. 00004				
34. Adjust the G & N POWER ADJUST control on the Test Control panel until the DVM indicates an input bus voltage of 33.5 (+0.25, -0) vdc. Record indication.				

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JOB G & N SYSTEM OPERATIONAL TEST		JDC 12617	REV J	PAGE 6 OF 6
SUBSYSTEM LEM G & N SYSTEM		ASSY		
PIPA AND IRIG TEST (High Voltage)				
35. Enter VERB 36 and press the ENTR pushbutton on the DSKY.				
36. Repeat steps 23 through 28.				
37. Enter VERB 36 and press the ENTR pushbutton on the DSKY.				
38. Connect the input bus to the Digital Voltmeter (DVM) by setting the CROSSBAR CONTROL on the Primary Signal Selector panel to 173.				
39. Adjust the G & N POWER ADJUST control on the Test Control panel until the DVM indicates an input bus voltage of 28.0 (+0.25) vdc.				

Horizontal Earth Rate Tolerances		
LOCATION	MIN VALUE	MAX VALUE
MIT	00000.64000	00000.84000
AC	00000.64000	00000.84000
MSC	00000.76000	00000.91000
NAA	00000.70000	00000.90000
MILA	00000.79000	00000.91000
GAEC	00000.65750	00000.85750

Table 1

APOLLO GAN  
EQUIPMENT TEST  
DATA SHEET 1 OF 2

JOB G & N SYSTEM OPERATIONAL TEST

ASSEMBLY UNDER TEST		TEST HISTORY					
SER. NO. _____ DWG. _____ REV. _____		DATE _____ START _____ END _____ SITE / LOCATION _____					
NAME _____		TIME _____ START _____ END _____ TOTAL ELAPSED _____					
MAJOR GROUND SUPPORT EQUIPMENT							
NAME _____ SER. NO. _____ CAL. DATE _____							
NAME _____ SER. NO. _____ CAL. DATE _____							
CONDUCTED BY _____ NAME / AFFILIATION _____ APPROVED BY _____ NAME / AFFILIATION _____							
JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
1 thru 18	Displays	All DSKY character and condition lamps performed as required					
22	IMU 28 vdc Bus	vdc	27.75		28.25		
23	LGC self check failures						
26	gravity	cm/sec <sup>2</sup>	975.0		985.9		
28	Horizontal earth rate (R2)	ERU	See Table 1		See Table 1		
30	IMU 28 vdc Bus	vdc	24.25		24.5		
32(23)	LGC self check failures						
32(26)	gravit.	cm/sec <sup>2</sup>	975.0		985.9		
32(28)	Horizontal earth rate (R2)	ERU	See Table 1		See Table 1		

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APOLLO GAN  
EQUIPMENT TEST  
DATA SHEET 2 OF 2

JOB G & N SYSTEM OPERATIONAL TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
34	IMU 28 vdc Bus	vdc	33.5		33.75		
36(23)	LGC self check failures						
36(26)	gravity	cm/sec <sup>2</sup>	975.0		985.9		
36(28)	Horizontal earth rate (R2)	ERU	See Table 1		See Table 1		
COMMENTS							

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FORM 00147  
Cng. 8-29-66

SUBSYSTEM LEM G & N SYSTEM		ASSY.		INITIAL TORR 27134 D.S. P&H:	
DESCRIPTION		The purpose of this test is to check gross G & N System operation. Computer-DSKY interface is checked by performing a computer controlled DSKY test which verifies correct DSKY character displays. A manual DSKY keyboard test is performed to verify correct key-character display operation. An alarm and interrupt test checks computer program error sensing capabilities. Finally a computer controlled test of PIPA and IRIG operation is performed with OG, IG and MG at 45 degrees. In this position each PIPA 1A is sending some portion of positive g and the accumulative PIPA		IMPORTANT See below.	
Rev.	Date	TORR NO.	PAGES REVISED	APPROVAL	REFERENCES
A	2-25-66	28177	2-5	ALL	MM ACMA
B	7-21-66	30272	3-4	ALL	EA MB
C	8-4-66	30519	2-5	1	EA
D	10-06-66	31617	1	-	EA
E	2-2-67	32855	1-5	-	EA
F	7-27-67	34232	1	-	EA
G	8-31-67	34457	3-4,5	1	EA
H	11-04-67	35165	1,3-5	1	EA
I	1-11-68	35356	3	ALL	EA
J	3-9-68	36044	ALL	ALL	EA
				INTERVAL	TOOLS AND MATERIAL

**DESCRIPTION (Cont)**  
measurement should be the value of local g. IRIG performance is checked by measuring the effect of the horizontal component of earth rate (cos  $\alpha$ ) in the same orientation. The IRIG and PIPA test is performed at normal, low and high prime power levels with the LGC Self Check being performed concurrently.

**IMPORTANT:** 1. Obtain the time of day of high order scalar overflow from JDC 12614. To prevent erroneous test results, do not enter a PIPA and IRIG Test within 0.3 hours of that time.

**INITIALIZATION**  
1. Insure that the system is in IBS STANDBY with the Computer operating and the CGC/LGC POWER ON and 400 CPB POWER ON pushbuttons on the Test Control panel are lighted.

2. Insure that connector assembly (2003099) is connected to the LGC test connector.

3. If the VERB display on the DSKY contains a number from 11 to 17, the KEY REL indicator may flash when DSKY entries are made.

VERIFICATION WITH SIDL REQUIRED BEFORE USE  
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FORM 10-1  
Ch. 1-1

**DSKY CHECK**  
4. Enter VERB 36 and press the ENTR pushbutton on the MAIN DSKY. The following DSKY displays shall illuminate for 5 seconds:  
a. UPLINK ACTY  
b. NO ATT  
c. STBY  
d. KEY REL Flashing  
e. TEMP  
f. GIMBAL LOCK  
g. PROG  
h. RESTART  
i. TRACKER  
j. OPR ERR Flashing  
k. VERB-NOUN Flashing  
l. Plus 88888 in ROW 1, ROW 2 and ROW 3  
on concurrently for 5 seconds

2. Perform the following DSKY operations:  
a. VERB 36 ENTR  
b. VERB 21 NOUN 27 ENTR  
c. 00011 ENTR  
3. Observe that all 9's are displayed in the PROG, VERB, NOUN and Row 1, Row 2, Row 3 character positions. Check that all applicable electroluminescent elements are lighted, including the 9's, the following shall be displayed for approximately 5 seconds:  
a. 9's  
b. 8's  
c. 7's  
d. 6's  
e. 5's  
f. 4's  
g. 3's  
h. 2's  
i. 1's  
j. 0's  
k. Minus signs in ROW 1, ROW 2, ROW 3 for 5 seconds  
l. VERB-NOUN Flashing  
m. COMP ACTY  
n. Plus signs in ROW 1, ROW 2, ROW 3 on concurrently for 5 seconds  
o. VERB-NOUN Flashing for 5 seconds  
p. COMP ACTY  
q. COMP ACTY  
on for 5 seconds then DSKY blanks

**MANUAL DSKY OPERATION CHECK**  
a. Perform the following DSKY operations:  
a. VERB 24 NOUN 01 ENTR  
b. Observe VERB 24 NOUN 01 Flashing  
c. 01700 ENTR  
d. Observe VERB 21 NOUN 01 Flashing  
e. +13345 ENTR  
f. Observe VERB 23 NOUN 01 Flashing  
g. -47890 Do NOT press ENTR

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6. Observe that Row 1 contains +13345 and that Row 2 contains -47890.

7. Press CLR pushbutton twice on DSKY. Observe that Row 1 and Row 2 are blank.

**ALARM AND INTERRUPT TEST**  
**PARTY FAIL TEST**  
a. Perform the following DSKY operations:  
a. VERB 36 ENTR  
b. VERB 27 NOUN 01 ENTR  
c. Observe VERB 27 NOUN 01 Flashing  
d. 70000 ENTR

9. Verify that the RESTART condition lamp on the DSKY, and the G/N CAUTION lamp on the Monitor panel are lighted. VERB 06 and VERB 05 and NOUN 21 shall be displayed and Rows 1, 2, and 3 shall indicate 00000 on the DSKY.

10. Press RSET pushbutton on the DSKY. Enter VERB 36 and press the ENTR pushbutton on the DSKY.

**RUPT LOCK**  
11. Perform the following DSKY operations:  
a. VERB 24 NOUN 01 ENTR

b. Observe VERB 24 NOUN 01 Flashing  
c. 01600 ENTR  
d. Observe VERB 21 NOUN 01 Flashing  
e. 01600 ENTR  
f. Observe VERB 23 NOUN 01 Flashing  
g. 00001 ENTR  
h. Observe VERB 23 NOUN 01 Flashing  
i. 01600 ENTR  
j. Observe VERB 23 NOUN 01 Flashing  
k. 00003 ENTR  
l. Observe VERB 31

12. Verify that the RESTART condition lamp on the DSKY and the G/N CAUTION lamp on the Monitor panel are lighted. VERB 06 and NOUN 21 shall be displayed and Rows 1, 2 and 3 shall indicate 00000 on the MAIN DSKY.

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13. Press RSET pushbutton on the DSKY. Enter VERB 36 and press the ENTR pushbutton on the DSKY.

**TC TRAP TEST**  
14. Perform the following DSKY operations:  
a. VERB 21 NOUN 02 ENTR  
b. Observe VERB 21 NOUN 02 Flashing  
c. 01600 ENTR  
d. Observe VERB 21 NOUN 02 Flashing  
e. 01600 ENTR  
f. VERB 25 NOUN 26 ENTR  
g. Observe VERB 21 NOUN 26 Flashing  
h. 04000 ENTR  
i. Observe VERB 23 NOUN 26 Flashing  
j. 01600 ENTR  
k. Observe VERB 23 NOUN 26 Flashing  
l. 00003 ENTR  
m. VERB 30 ENTR  
15. Verify that the RESTART condition lamp on the DSKY, and the G/N CAUTION lamp on the Monitor panel are lighted. VERB 06 and NOUN 21 shall be displayed and Rows 1, 2 and 3 shall indicate 00000 on the MAIN DSKY.

16. Press RSET pushbutton on the DSKY. Enter VERB 36 and press the ENTR pushbutton on the DSKY.

**NIGHT WATCHMAN TEST**  
17. Perform the following MAIN DSKY operations:  
a. VERB 24 NOUN 01 ENTR  
b. Observe VERB 24 NOUN 01 Flashing  
c. 01600 ENTR  
d. Observe VERB 21 NOUN 01 Flashing  
e. 30001 ENTR  
f. Observe VERB 23 NOUN 01 Flashing  
g. 01600 ENTR  
h. VERB 25 NOUN 26 ENTR  
i. Observe VERB 21 NOUN 26 Flashing  
j. 03400 ENTR  
k. Observe VERB 23 NOUN 26 Flashing  
l. 01600 ENTR  
m. Observe VERB 23 NOUN 26 Flashing  
n. 00003 ENTR  
o. VERB 30 ENTR  
18. Verify that the RESTART condition lamp on the DSKY and the G/N CAUTION lamp on the Monitor panel are lighted. VERB 06 and NOUN 21 shall be displayed and Rows 1, 2 and 3 shall indicate 00000 on the MAIN DSKY.

19. Press RSET pushbutton on DSKY. Enter VERB 36 and press the ENTR pushbutton on the DSKY.

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SUBSYSTEM LEM G &amp; N SYSTEM

ASSY

IRIG AND PIPA TEST INITIALIZATION  
20. Press ES OPERATE pushbutton on the Test Control panel.

21. Connect the input bus to the Digital Voltmeter (DVM) by setting the CROSSBAR CONTROL on the Primary Signal Selector panel to 173.

22. Adjust the G & N POWER ADJUST control on the Test Control panel until the DVM indicates an input bus voltage of 28.0 (+0.25) vdc. Record indication.

LGC SELF CHECK  
23. Perform the following DSKY operations:

a. VERB 21 NOUN 27 ENTR

b. Observe VERB 21 Flashing

c. 77767 ENTR

Allow test to run 5 minutes. Record any failures indicated by VERB 06 NOUN 31 being displayed on DSKY'a. If no failure occurs, write "None" on data sheet.

24. Insure that at least 90 seconds have elapsed since performing Step 20 and that the PIPA loops have closed as indicated by a butterfly pattern on the PIPA monitor scope of the OIA.

PIPA AND IRIG TEST (Nominal Voltage)

25. Perform the following DSKY operations:

a. VERB 27 ENTR

b. Observe NOUN 01 Flashing

c. 00004 ENTR

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SUBSYSTEM LEM G &amp; N SYSTEM

ASSY

34. Adjust the G & N POWER ADJUST control on the Test Control panel until the DVM indicates an input bus voltage of 33.5 (+0. -0.25) vdc. Record indication.

35. Enter VERB 36 and press the ENTR pushbutton on the DSKY.

36. Repeat steps 23 through 26.

37. Enter VERB 36 and press the ENTR pushbutton on the DSKY.

38. Connect the input bus to the Digital Voltmeter (DVM) by setting the CROSSBAR CONTROL on the Primary Signal Selector panel to 173.

39. Adjust the G & N POWER ADJUST control on the Test Control panel until the DVM indicates an input bus voltage of 38.0 (+0.25) vdc.

Horizontal Earth Rate Tolerances		
LOCATION	MIN VALUE	MAX VALUE
MIT	00000, 64000	00000, 84000
AC	00000, 64000	00000, 84000
MSC	00000, 76000	00000, 91000
NAA	00000, 70000	00000, 90000
MILA	00000, 78000	00000, 91000
GAEC	00000, 65750	00000, 85750

Table 1

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# APOLLO 68N EQUIPMENT TEST DATA SHEET 1 OF 2

JOB G &amp; N SYSTEM OPERATIONAL TEST

ASSEMBLY UNDER TEST		TEST HISTORY	
TITLE	DATE	TIME	BY
SER. NO. _____	DWG. _____	REV. _____	INITIALS _____
NAME _____ SER. NO. _____			
NAME _____ SER. NO. _____			
CONDUCTED BY _____ APPROVED BY _____			
JDC ITEM NO.	PARAMETER	UNITS	RECORDED VALUE
1 thru 18	Displays		All DSKY character and condition lamps performed as required
22	IMU 28 vdc Bus	vdc	27.75
23	LGC self check failures		
26	gravity	cm/sec <sup>2</sup>	975.0
28	Horizontal earth rate (R2)	ERU	See Table 1
30	IMU 28 vdc Bus	vdc	24.50
32(23)	LGC self check failures		
32(26)	gravity	cm/sec <sup>2</sup>	975.0
32(28)	Horizontal earth rate (R2)	ERU	See Table 1

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## APOLLO 68N EQUIPMENT TEST DATA SHEET 2 OF 2

JOB G &amp; N SYSTEM OPERATIONAL TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ/ACC
34	IMU 28 vdc Bus	vdc	33.25		33.50	
36(23)	LGC self check failures					
36(26)	gravity	cm/sec <sup>2</sup>	975.0		985.9	
36(28)	Horizontal earth rate (R2)	ERU	See Table 1		See Table 1	
COMMENTS						

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SUBSYSTEM LEM G & N SYSTEM ASSY

DESCRIPTION The purpose of this test is to check gross G & N System operation. Computer-DSKY interface is checked by performing a computer controlled DSKY test which verifies correct DSKY character displays. A manual DSKY keyboard test is performed to verify correct key-character display operation. An alarm and interrupt test checks computer program error sensing capabilities. Finally a computer controlled test of PIPA and IRI3 operation is performed with OG, IG and MG at 45 degrees. In this position operation is performed with OG, IG and MG at 45 degrees. In this position each PIPA 1<sub>A</sub> is sensing some portion of positive g and the accumulative PIPA

Ref	Test	Date	TORR	PAGES REVISED	APPROVAL	REFERENCES
Let.	MO.	JDC	D.S.	MUT	NASA	
A	7-25-66	29177	2-5	ALL	MM	ACM
B	7-21-66	30272	3-4	-	EA	MB
C	8-4-66	30519	2-5	1	EA	-
D	10-30-66	31617	1	-	EA	-
E	2-2-67	32385	1-5	-	EA	-
F	7-27-67	34232	1-5	-	EA	-
G	8-31-67	34457	3-4,5	1	EA	-
H	11-30-67	35185	1,3,5	1	EA	-
I	1-11-68	35383	3	ALL	EA	-
J	4-9-68	36044	ALL	ALL	EA	-
K	7-25-68	36585	2,3	-	EA	-

DESCRIPTION (Cont)  
measurement should be the value of local g. IRI3 performance is checked by measuring the effect of the horizontal component of earth rate (cos  $\alpha$ ) in the same orientation. The IRI3 and PIPA test is performed at normal, low and high prime power levels with the LGC Self Check being performed concurrently.

IMPORTANT: 1. Obtain the time of day of high order scalar overflow from JDC 12614. To prevent erroneous test results, do not enter a PIPA and IRI3 Test within 0.2 hours of that time.

#### INITIALIZATION

1. Insure that the system is in ISS STANDBY with the Computer operating and the COG/LGC POWER ON and 400 CPS POWER ON pushbuttons on the Test Control panel are lighted.

2. Insure that connector assembly (2003099) is connected to the LGC test connector.  
3. If the VERB display on the DSKY contains a number from 11 to 17, the KEY REL indicator may flash when DSKY entries are made.

VERIFICATION WITH SIDL REQUIRED BEFORE USE

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SUBSYSTEM LEM G & N SYSTEM ASSY

#### DSKY CHECK

2. Perform the following DSKY operations:  
a. VERB 36 ENTR  
b. VERB 21 NOUN 27 ENTR  
c. 00011 ENTR

3. Observe that all 9's are displayed in the PROG, VERB, NOUN and Row 1, Row 2, Row 3 character positions. Check that all applicable electroluminescent elements are lighted, including the 9's, the following shall be displayed for approximately 5 seconds.

- a. 9's
- b. 8's
- c. 7's
- d. 6's
- e. 5's
- f. 4's
- g. 3's
- h. 2's
- i. 1's

on concurrently for 5 seconds

After indications a through i go out, plus 88888's shall remain on ROW 1, ROW 2, ROW 3 and in VERB-NOUN displays.

#### MANUAL DSKY OPERATION CHECK

5. Perform the following DSKY operations:

- a. VERB 24 NOUN 01 ENTR
- b. Observe VERB 24 NOUN 01 Flashing ENTR
- c. 01700
- d. Observe VERB 21 NOUN 01 Flashing ENTR
- e. +12345
- f. Observe VERB 23 NOUN 01 Flashing ENTR
- g. -67890 Do NOT press ENTR

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SUBSYSTEM LEM G & N SYSTEM ASSY

6. Observe that Row 1 contains +12345 and that Row 2 contains -67890.  
7. Press CLR pushbutton twice on DSKY. Observe that Row 1 and Row 2 are blank.

#### ALARM AND INTERRUPT TEST

##### PARTY FAIL TEST

8. Perform the following DSKY operations:

- a. VERB 36 ENTR
- b. VERB 21 NOUN 01 ENTR
- c. Observe:
  - VERB 21 NOUN 01 Flashing ENTR
  - 01365 ENTR
  - 00000 ENTR
  - VERB 27 NOUN 01 ENTR
- g. Observe:
  - VERB 27 NOUN 01 Flashing ENTR
  - 70000 ENTR

9. Verify that the RESTART condition lamp on the DSKY, and the G/N CAUTION lamp on the Monitor panel are lighted. VERB 05 and NOUN 31 shall be displayed and Rows 1, 2, and 3 shall indicate 00000 on the DSKY.

10. Press RSET pushbutton on the DSKY. Enter VERB 36 and press the ENTR pushbutton on the DSKY.

#### RUPT LOCK

11. Perform the following DSKY operations:  
a. VERB 24 NOUN 01 ENTR

13. Press RSET pushbutton on the DSKY. Enter VERB 36 and press the ENTR pushbutton on the DSKY.

#### TC TRAP TEST

14. Perform the following DSKY operations:

- a. VERB 21 NOUN 02 ENTR
- b. Observe VERB 21 NOUN 02 Flashing ENTR
- c. 01600
- d. Observe VERB 21 NOUN 02 Flashing ENTR
- e. 01600
- f. VERB 25 NOUN 26 ENTR
- g. VERB 21 NOUN 26 Flashing ENTR
- h. 04000
- i. Observe VERB 22 NOUN 26 Flashing ENTR
- j. 01600
- k. Observe VERB 23 NOUN 26 Flashing ENTR
- l. 00003
- m. VERB 30 ENTR

15. Verify that the RESTART condition lamp on the DSKY, and the G/N CAUTION lamp on the Monitor panel are lighted. VERB 05 and NOUN 31 shall be displayed and Rows 1, 2 and 3 shall indicate 00000 on the MAIN DSKY.

16. Press RSET pushbutton on the DSKY. Enter VERB 36 and press the ENTR pushbutton on the DSKY.

#### NIGHT WATCHMAN TEST

17. Perform the following MAIN DSKY operations:

- a. VERB 24 NOUN 01 ENTR
- b. Observe VERB 24 NOUN 01 Flashing ENTR
- c. 01600
- d. Observe VERB 21 NOUN 01 Flashing ENTR
- e. 30001
- f. Observe VERB 22 NOUN 01 Flashing ENTR
- g. 01600
- h. VERB 25 NOUN 26 ENTR
- i. Observe VERB 21 NOUN 26 Flashing ENTR
- j. 03400
- k. Observe VERB 22 NOUN 26 Flashing ENTR
- l. 01600
- m. Observe VERB 23 NOUN 26 Flashing ENTR
- n. 00003
- o. VERB 30 ENTR

18. Verify that the RESTART condition lamp on the DSKY and the G/N CAUTION lamp on the Monitor panel are lighted. VERB 05 and NOUN 31 shall be displayed and Rows 1, 2 and 3 shall indicate 00000 on the MAIN DSKY.

19. Press RSET pushbutton on DSKY. Enter VERB 36 and press the ENTR pushbutton on the DSKY.

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SUBSYSTEM LEM G & N SYSTEM

ASSY

IRIG AND PIPA TEST INITIALIZATION  
20. Press ISS OPERATE pushbutton on the Test Control panel.

21. Connect the input bus to the Digital Voltmeter (DVM) by setting the CROSSBAR CONTROL on the Primary Signal Selector panel to 173.

22. Adjust the G & N POWER ADJUST control on the Test Control panel until the DVM indicates an input bus voltage of 28.0 (+0.25) vdc. Record indication.

LGC SELF CHECK  
23. Perform the following DSKY operations:

- a. VERB 21 NOUN 27 ENTER
- b. Observe VERB 21 NOUN 27 Flashing
- c. 77767 ENTER

Allow test to run 5 minutes. Record any failures indicated by VERB 05 NOUN 31 being displayed on DSKY's. If no failure occurs, write "None" on data sheet.

24. Insure that at least 90 seconds have elapsed since performing Step 20 and that the PIPA loops have closed as indicated by a butterfly pattern on the PIPA monitor scope of the OIA.

PIPA AND IRIG TEST (Nominal Voltage)  
25. Perform the following DSKY operations:

- a. VERB 67 ENTER
- b. Observe VERB 21 NOUN 01 Flashing
- c. 00004 ENTER

4. Observe VERB 16 NOUN 20 Displayed  
a. VERB 34 ENTER

26. In approximately 12 minutes VERB 04 and NOUN 46 will flash. Local gravity as measured by X, Y, and Z PIPA will be displayed in Row 1 and Row 2. Record indications.

27. Enter VERB 33 and press ENTER pushbutton on the DSKY.

28. When VERB 04 and NOUN 46 flash the horizontal component of earth rate on the X, Y and Z IRIGs will be displayed in Row 2. Record indication.

PIPA AND IRIG TEST (Low Voltage)

29. Connect the input bus to the Digital Voltmeter (DVM) by setting the CROSSBAR CONTROL on the Primary Signal Selector panel to 173.

30. Adjust the G & N POWER ADJUST control on the Test Control panel until the DVM indicates input bus voltage of 24.5 (+0.25, -0) vdc. Record indication.

31. Enter VERB 36 and press the ENTER pushbutton on the DSKY.

32. Repeat steps 23 through 28.  
PIPA AND IRIG TEST (High Voltage)

33. Connect the input bus to the Digital Voltmeter (DVM) by setting the CROSSBAR CONTROL on the Primary Signal Selector panel to 173.

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APOLLO 68N  
EQUIPMENT TEST  
DATA SHEET 1 OF 2

JOB G & N SYSTEM OPERATIONAL TEST

TITLE		DATE		TEST HISTORY	
SER. NO.	OWG	REV.	TIME	START	END
NAME		SER. NO.		CAL DATE	
NAME		SER. NO.		CAL DATE	
CONDUCTED BY		NAME/AFFILIATION		APPROVED BY	
NAME/AFFILIATION		NAME/AFFILIATION		NAME/AFFILIATION	

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ ACC
1 thru 18	Displays	All DSKY character and condition lamps performed as required				
23	IMU 28 vdc Bus	vdc	27.75		28.25	
23	LGC self check failures					
26	gravity	cm/sec <sup>2</sup>	975.0		985.9	
26	Horizontal earth rate (R2)	ERU	See Table 1		See Table 1	
30	IMU 28 vdc Bus	vdc	24.50		24.75	
32(23)	LGC self check failures					
32(26)	gravity	cm/sec <sup>2</sup>	975.0		985.9	
32(28)	Horizontal earth rate (R2)	ERU	See Table 1		See Table 1	

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SUBSYSTEM LEM G & N SYSTEM

ASSY

34. Adjust the G & N POWER ADJUST control on the Test Control panel until the DVM indicates an input bus voltage of 33.5 (+0, -0.25) vdc. Record indication.

35. Enter VERB 36 and press the ENTER pushbutton on the DSKY.

36. Repeat steps 23 through 28.

37. Enter VERB 36 and press the ENTER pushbutton on the DSKY.

38. Connect the input bus to the Digital Voltmeter (DVM) by setting the CROSSBAR CONTROL on the Primary Signal Selector panel to 173.

39. Adjust the G & N POWER ADJUST control on the Test Control panel until the DVM indicates an input bus voltage of 28.0 (+0.25) vdc.

Horizontal Earth Rate Tolerances		
LOCATION	MIN VALUE	MAX VALUE
MIT	00000, 84000	00000, 84000
AC	00000, 84000	00000, 84000
MSC	00000, 76000	00000, 81000
NAA	00000, 70000	00000, 90000
MILA	00000, 79000	00000, 81000
GAEC	00000, 65750	00000, 85750

Table 1

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APOLLO 68N  
EQUIPMENT TEST  
DATA SHEET 2 OF 2

JOB G & N SYSTEM OPERATIONAL TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ ACC
34	IMU 28 vdc Bus	vdc	33.25		33.50	
36(23)	LGC self check failures					
36(26)	gravity	cm/sec <sup>2</sup>	975.0		985.9	
36(28)	Horizontal earth rate (R2)	ERU	See Table 1		See Table 1	

COMMENTS

DATE 15 MAR 66

SUBSYSTEM LEM G & N SYSTEM			
DESCRIPTION The purpose of this test is to check gross G & N system operations. Computer interface is checked by performing a computer controlled DSKY test which verifies correct DSKY character displays. A manual DSKY keyboard test is performed to verify correct key-character display operation. An alarm and interrupts test checks computer			
Rev.	Date	TORR NO.	PAGES REVISED
A	2-25-66	28177	2-5
B	2-21-66	30272	3-4
C	3-4-66	30519	2-5
D	10-20-66	31617	1
E	2-2-67	32855	1-5
F	7-27-67	34232	1
G	9-31-67	34437	3-4,5
H	1-10-67	35185	1,3,5
J	1-11-68	35356	3
K	4-9-68	36044	All
L	2-25-68	36585	2,3
M	10-24-68	36957	All

DESCRIPTION (cont)

program error sensing capabilities. Finally a computer controlled test of PIPA and IRIG operation is performed with CG, IG, and MG at 46 degrees. In this position each PIPA IA is sensing some portion of positive g and the accumulative PIPA measurement should be the value of local g. IRIG performance is checked by measuring the effect of the horizontal component of earth rate (cos x) in the same orientation. The IRIG and PIPA test is performed at normal, low, and high prime power levels with the LGC self check being performed concurrently.

IMPORTANT: 1. Obtain the time of day of high order scalar overflow from JDC 12614. To prevent erroneous test results, do not enter a PIPA and IRIG test within 0.2 hour of that time.

VERIFICATION WITH SIDL REQUIRED BEFORE USE

DATE 15 MAR 66

SUBSYSTEM LEM G & N SYSTEM			
DESCRIPTION The purpose of this test is to check gross G & N system operations. Computer interface is checked by performing a computer controlled DSKY test which verifies correct DSKY character displays. A manual DSKY keyboard test is performed to verify correct key-character display operation. An alarm and interrupts test checks computer			
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D	10-20-66	31617	1
E	2-2-67	32855	1-5
F	7-27-67	34232	1
G	9-31-67	34437	3-4,5
H	1-10-67	35185	1,3,5
J	1-11-68	35356	3
K	4-9-68	36044	All
L	2-25-68	36585	2,3
M	10-24-68	36957	All

SUBSYSTEM LEM G & N SYSTEM			
DESCRIPTION The purpose of this test is to check gross G & N system operations. Computer interface is checked by performing a computer controlled DSKY test which verifies correct DSKY character displays. A manual DSKY keyboard test is performed to verify correct key-character display operation. An alarm and interrupts test checks computer			
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C	3-4-66	30519	2-5
D	10-20-66	31617	1
E	2-2-67	32855	1-5
F	7-27-67	34232	1
G	9-31-67	34437	3-4,5
H	1-10-67	35185	1,3,5
J	1-11-68	35356	3
K	4-9-68	36044	All
L	2-25-68	36585	2,3
M	10-24-68	36957	All

SUBSYSTEM LEM G & N SYSTEM			
DESCRIPTION The purpose of this test is to check gross G & N system operations. Computer interface is checked by performing a computer controlled DSKY test which verifies correct DSKY character displays. A manual DSKY keyboard test is performed to verify correct key-character display operation. An alarm and interrupts test checks computer			
Rev.	Date	TORR NO.	PAGES REVISED
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E	2-2-67	32855	1-5
F	7-27-67	34232	1
G	9-31-67	34437	3-4,5
H	1-10-67	35185	1,3,5
J	1-11-68	35356	3
K	4-9-68	36044	All
L	2-25-68	36585	2,3
M	10-24-68	36957	All



SUBSYSTEM	LEM G & N SYSTEM	ASSY
<u>MANUAL LOAD PROCEDURES</u>		CTS UPLINK TAPE LOAD PROCEDURES
<u>NIGHT WATCHMAN TEST</u>		<u>NIGHT WATCHMAN TEST</u>
25. Perform following DSKY operations:		25. Press EXECUTE pushbutton on Programmer and Monitor panel.
a. VERB 24	NOUN 01	ENTR
b. Observe:		
VERB 24	NOUN 01	Flashing
c. 01600		ENTR
d. Observe:		
VERB 21	NOUN 01	Flashing
e. 30001		ENTR
f. Observe:		
VERB 22	NOUN 01	Flashing
g. 01600		ENTR
h. VERB 25	NOUN 26	ENTR
i. Observe:		
VERB 21	NOUN 26	Flashing
j. 03400		ENTR
k. Observe:		
VERB 22	NOUN 26	Flashing
l. 01600		ENTR
m. Observe:		
VERB 23	NOUN 26	Flashing
n. 00003		ENTR
o. VERB 30		ENTR

SUBSYSTEM	LEM G & N SYSTEM	ASSY
MANUAL LOAD PROCEDURES	CTS UPLINK TAPE LOAD PROCEDURES	
and Monitor panel. All CTS alarm indica-		
tions shall go out.		
28. Enter VERB 36 and press ENTR		28. Press EXECUTE pushbutton on Pro-
pushbutton on DSKY.		grammer and Monitor panel.
T5/T6 RUPT TEST		T5/T6 RUPT TEST
29. Perform following DSKY operations:		29. Press EXECUTE pushbutton on Pro-
a. VERB 21 NOUN 01 ENTR		grammer and Monitor panel.
b. 01300 ENTR		
c. 31304 ENTR		
d. NOUN 15 ENTR		
e. 00006 ENTR ENTR		
f. 05013 ENTR ENTR		
g. 04511 ENTR ENTR		
h. 40000 ENTR ENTR		
i. 31312 ENTR ENTR		
j. 54030 ENTR ENTR		
k. 31313 ENTR ENTR		
l. 54345 ENTR ENTR		
m. 04353 ENTR ENTR		
n. 36027 ENTR ENTR		
o. 01314 ENTR ENTR		
p. 04572 ENTR ENTR		
q. 00011 ENTR ENTR		
r. 01300 ENTR		
s. VERB 25 NOUN 26 ENTR		
t. 01000 ENTR		
u. 01306 ENTR		
v. 00002 ENTR		
w. VERB 21 NOUN 01 ENTR		
x. 00031 ENTR		
y. 37777 ENTR		
z. VERB 11 NOUN 01 ENTR		
aa. 00031 ENTR		

**SUBSYSTEM LEM G & N SYSTEM**  
**MANUAL LOAD PROCEDURES**

30. Set AGREEMENT A digit switches on Logic Drawer No. 2 to XXXX4006. Set AGREEMENT A switch to SAMPLE.

31. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.

32. Enter VERB 30 and press ENTR pushbutton on DSKY.

33. Observe that in approximately 10 seconds the PROG display on the DSKY indicates 11, Row 1 increments to 77777, causing RZ display on Programmer and Monitor panel to indicate 4006.

34. Perform following DSKY operations:

- a. VERB 36 ENTR
- b. VERB 21 NOUN 01 ENTR
- c. 00031 ENTR
- d. 40000 ENTR
- e. VERB 11 NOUN 01 ENTR
- f. 00031 ENTR

35. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.

36. Enter VERB 30 and press ENTR pushbutton on DSKY.

37. Observe that in approximately 10 seconds the PROG display on the DSKY indicates 11 and Row 1 increments to 77777 causing RZ display on Programmer and Monitor panel to indicate 4006.

**ASSY**  
**CTS UPLINK TAPE LOAD PROCEDURES**

30. When tape stops, set AGREEMENT A digit switches on Logic Drawer No. 2 to XXXX4006. Set AGREEMENT A switch to SAMPLE.

31. Verify that RG display does not indicate 34055.

32. Press EXECUTE pushbutton on Programmer and Monitor panel.

33. Observe that in approximately 10 seconds the PROG display on the DSKY indicates 11, Row 1 increments to 77777, causing RG display on Programmer and Monitor panel to indicate 34055.

34. Press EXECUTE pushbutton on Programmer and Monitor panel.

35. When tape stops, set AGREEMENT A switch to OFF and then to SAMPLE. Verify that RG display does not indicate 34055.

36. Press EXECUTE pushbutton on Programmer and Monitor panel.

37. Observe that in approximately 10 seconds the PROG display on the DSKY indicates 11 and Row 1 increments to 77777 causing RG display on Programmer and Monitor panel to indicate 34055.

SUBSYSTEM	LEM G & N SYSTEM	ASSY
<u>MANUAL LOAD PROCEDURES</u>		<u>CTS UPLINK TAPE LOAD PROCEDURES</u>
36. Enter VERB 36 and press ENTR pushbutton on DSKY.		36. Press EXECUTE pushbutton on Programmer and Monitor panel.
<u>RADAR RUPT TEST</u>		<u>RADAR RUPT TEST</u>
39. Perform following DSKY operations:		39. Press EXECUTE pushbutton on Programmer and Monitor panel.
a. VERB 24	NOUN 01	ENTR
b. 01303		ENTR
c. 04353		ENTR
d. 00010		ENTR
e. VERB 22	NOUN 26	ENTR
f. 01300		ENTR
40. Set AGREEMENT A digitswitches on Logic Drawer No. 2 to XXXX4045. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.		40. When tape stops, set AGREEMENT A digitswitches on Logic Drawer No. 2 to XXXX4045. Set AGREEMENT A switch to OFF and then to SAMPLE. Verify that RG display does not indicate 34062.
41. Enter VERB 30 and press ENTR pushbutton on DSKY.		41. Press EXECUTE pushbutton on Programmer and Monitor panel.
42. Verify that RZ display on Programmer and Monitor panel indicates 4046 and PROG lamp on DSKY is lighted. Press RSET pushbutton. PROG lamp shall go out.		42. Verify that RG display indicates 34062 and PROG lamp on DSKY is lighted. Press RSET pushbutton. PROG lamp shall go out.
<u>T10 RUPT TEST</u>		<u>T10 RUPT TEST</u>
43. Set AGREEMENT A digitswitches on Logic Drawer No. 2 to XXXX4050.		43. Set AGREEMENT A digitswitches on Logic Drawer No. 2 to XXXX4050.
44. Perform following DSKY operations:		44. Press EXECUTE pushbutton on Programmer and Monitor panel.
a. VERB 21	NOUN 01	ENTR
b. 01304		ENTR
c. 04000		ENTR
d. VERB 30		ENTR
45. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.		45. When tape stops, set AGREEMENT A switch to OFF and then to SAMPLE. Verify that RG display does not indicate 50017.



JOB	G & N SYSTEM OPERATIONAL TEST	JDC 12617 REV M PAGE 13 OF 26
SUBSYSTEM	LEM G & N SYSTEM	ASSY
MANUAL LOAD PROCEDURES		
46. Press to light CH31-1/IN2-1 pushbutton on RDC Interface panel. Verify that RZ display on Programmer and Monitor panel indicates 4051.		
47. Press to extinguish CH31-1/IN2-1 pushbutton on RDC Interface panel.		
48. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.		
49. Enter VERB 30 and press ENTR pushbutton on DSKY.		
50. Press to light CH31-2/IN2-2 pushbutton on RDC Interface panel. Verify that RZ display on Programmer and Monitor panel indicates 4051.		
51. Press to extinguish CH31-2/IN2-2 pushbutton on RDC Interface panel.		
52. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.		
53. Enter VERB 30 and press ENTR pushbutton on DSKY.		
54. Press to light CH31-3/IN2-3 pushbutton on RDC Interface panel. Verify that RZ display on Programmer and Monitor panel indicates 4051.		
55. Press to extinguish CH31-3/IN2-3 pushbutton on RDC Interface panel.		
56. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.		
57. Enter VERB 30 and Press ENTR pushbutton on DSKY.		

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JOB	G & N SYSTEM OPERATIONAL TEST	JDC 12617 REV M PAGE 14 OF 26
SUBSYSTEM	LEM G & N SYSTEM	ASSY
MANUAL LOAD PROCEDURES		
58. Press to light CH31-4/IN2-4 pushbutton on RDC Interface panel. Verify that RZ display on Programmer and Monitor panel indicates 4051.		
59. Press to extinguish CH31-4/IN2-4 pushbutton on RDC Interface panel.		
60. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.		
61. Enter VERB 30 and press ENTR pushbutton on DSKY.		
62. Press to light CH31-5/IN2-5 pushbutton on RDC Interface panel. Verify that RZ display on Programmer and Monitor panel indicates 4051.		
63. Press to extinguish CH31-5/IN2-5 pushbutton on RDC Interface panel.		
64. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.		
65. Enter VERB 30 and press ENTR pushbutton on DSKY.		
66. Press to light CH31-6/IN2-6 pushbutton on RDC Interface panel. Verify that RZ display on Programmer and Monitor panel indicates 4051.		
67. Press to extinguish CH31-6/IN2-6 pushbutton on RDC Interface panel.		
68. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.		

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JOB	G & N SYSTEM OPERATIONAL TEST	JDC 12617 REV M PAGE 15 OF 26
SUBSYSTEM	LEM G & N SYSTEM	ASSY
MANUAL LOAD PROCEDURES		
69. Perform following DSKY operations:		
a. VERB 21 NOUN 01 ENTR		
b. 01304 ENTR		
c. 10000 ENTR		
d. VERB 30 ENTR		
70. Press to light CH31-7/IN2-7 pushbutton on RDC Interface panel. Verify that RZ display on Programmer and Monitor panel indicates 4051.		
71. Press to extinguish CH31-7/IN2-7 pushbutton on RDC Interface panel.		
72. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.		
73. Enter VERB 30 and press ENTR pushbutton on DSKY. Verify that RZ display on Programmer and Monitor panel indicates zero.		
74. Press to light CH31-8/IN2-8 pushbutton on RDC Interface panel. Verify that RZ display on Programmer and Monitor panel indicates 4051.		
75. Press to extinguish CH31-8/IN2-8 pushbutton on RDC Interface panel.		
76. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.		
77. Enter VERB 30 and press ENTR pushbutton on DSKY. Verify that RZ display on Programmer and Monitor panel indicates zero.		

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JOB	G & N SYSTEM OPERATIONAL TEST	JDC 12617 REV M PAGE 16 OF 26
SUBSYSTEM	LEM G & N SYSTEM	ASSY
MANUAL LOAD PROCEDURES		
78. Press to light CH31-9/IN2-9 pushbutton on RDC Interface panel. Verify that RZ display on Programmer and Monitor panel indicates 4051.		
79. Press to extinguish CH31-9/IN2-9 pushbutton on RDC Interface panel.		
80. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.		
81. Enter VERB 30 and press ENTR pushbutton on DSKY. Verify that RZ display on Programmer and Monitor panel indicates zero.		
82. Press to light CH31-10/IN2-10 pushbutton on RDC Interface panel. Verify that RZ display on Programmer and Monitor panel indicates 4051.		
83. Press to extinguish CH31-10/IN2-10 pushbutton on RDC Interface panel.		
84. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.		
85. Enter VERB 30 and press ENTR pushbutton on DSKY. Verify that RZ display on Programmer and Monitor panel indicates zero.		
86. Press to light CH31-11/IN2-11 pushbutton on RDC Interface panel. Verify that RZ display on Programmer and Monitor panel indicates 4051.		
87. Press to extinguish CH31-11/IN2-11 pushbutton on RDC Interface panel.		

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JOB G & N SYSTEM OPERATIONAL TEST			JDC 12617 REV M PAGE 21 OF 26
SUBSYSTEM	LEM G & N SYSTEM	ASSY	
MANUAL LOAD PROCEDURES			
CTS UPLINK TAPE LOAD PROCEDURES			
126. Press to extinguish CH32-8/IN3-8 pushbutton on RDC Interface panel.			
127. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.			
128. Press to light CH32-9/IN3-9 pushbutton on RDC Interface panel. Verify that RZ display on Programmer and Monitor panel indicates zero.			
129. Enter VERB 30 and press ENTR pushbutton on DSKY. Verify that RZ display on Programmer and Monitor panel indicates 4051.			
130. Press to extinguish CH32-9/IN3-9 pushbutton on RDC Interface panel.			
131. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.			
132. Press to light CH32-10/IN3-10 pushbutton on RDC Interface panel. Verify that RZ display on Programmer and Monitor panel indicates zero.			
133. Enter VERB 30 and press ENTR pushbutton on DSKY. Verify that RZ display on Programmer and Monitor panel indicates 4051.			
134. Press to extinguish CH32-10/IN3-10 pushbutton on RDC Interface panel.			
135. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.			
136. Enter VERB 36 and press ENTR pushbutton on DSKY.			

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JOB G & N SYSTEM OPERATIONAL TEST			JDC 12617 REV M PAGE 22 OF 26
SUBSYSTEM	LEM G & N SYSTEM	ASSY	
MANUAL LOAD PROCEDURES			
CTS UPLINK TAPE LOAD PROCEDURES			
LGC SELF CHECK			
137. Perform following DSKY operations:			
a. VERB 21	NOUN 27	ENTR	
b. Observe:			
VERB 21	NOUN 27	Flashing	
c. 77767			
Allow test to run 5 minutes. Record any failures indicated by VERB 05 NOUN 31 being displayed on DSKY. If no failure occurs, write "none" on data sheet.			
NOTE: Perform steps 138 through 141 during 5 minute wait of LGC Self Test.			
138. Press 188 OPERATE pushbutton on Test Control panel.			
139. Insure that at least 90 seconds have elapsed since performing step 138 and that the PIPA loops have closed as indicated by a butterfly pattern on the PIPA monitor scope of the OIA.			
140. Connect the input bus to the Digital Voltmeter (DVM) by setting the CROSSBAR CONTROL on the Primary Signal Selector panel to 173.			
141. Adjust the G&N POWER ADJUST control on the Test Control panel until the DVM indicates an input bus voltage of 28.0 (±0.25) vdc. Record indication.			
142. Press ALARM RESET pushbutton on Programmer and Monitor panel. Verify that AGC ALARMS #6 lamp goes out.			

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JOB G & N SYSTEM OPERATIONAL TEST			JDC 12617 REV M PAGE 23 OF 26
SUBSYSTEM	LEM G & N SYSTEM	ASSY	
MANUAL LOAD PROCEDURES			
CTS UPLINK TAPE LOAD PROCEDURES			
143. Perform following DSKY operations:			
a. VERB 87	ENTR		
b. Observe:			
VERB 21	NOUN 01	Flashing	
c. 00004			
d. Observe:			
VERB 16	NOUN 20	Displayed	
e. VERB 34	ENTR		
144. In approximately 12 minutes, VERB 06 NOUN 66 will flash. Local gravity as measured by X, Y, and Z PIPA's will be displayed in Row 1 and Row 2. Record indications.			
145. Enter VERB 33 and press ENTR pushbutton on DSKY.			
146. When VERB 06 NOUN 66 flash, the horizontal component of earth rate on the X, Y, and Z IRIG's will be displayed in Row 2. Record indication.			
147. Connect the input bus to the DVM by setting the CROSSBAR CONTROL on the Primary Signal Selector panel to 173.			
148. Adjust the G&N POWER ADJUST control on the Test Control panel until the DVM indicates an input bus voltage of 24.5 (+0.25, -0) vdc. Record indication.			
149. Enter VERB 36 and press ENTR pushbutton on DSKY.			
150. Perform following DSKY operations:			
a. VERB 21	NOUN 27	ENTR	
b. Observe:			
VERB 21	NOUN 27	Flashing	
c. 77767			

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JOB G & N SYSTEM OPERATIONAL TEST			JDC 12617 REV M PAGE 24 OF 26
SUBSYSTEM	LEM G & N SYSTEM	ASSY	
MANUAL LOAD PROCEDURES			
CTS UPLINK TAPE LOAD PROCEDURES			
Allow test to run 5 minutes. Record any failures indicated by VERB 05 NOUN 31 being displayed on DSKY. If no failure occurs, write "none" on data sheet.			
151. Perform following DSKY operations:			
a. VERB 87	ENTR		
b. Observe:			
VERB 21	NOUN 01	Flashing	
c. 00004			
d. Observe:			
VERB 16	NOUN 20	Displayed	
e. VERB 34	ENTR		
152. In approximately 12 minutes, VERB 06 NOUN 66 will flash. Local gravity as measured by X, Y, and Z PIPA's will be displayed in Row 1 and Row 2. Record indications.			
153. Enter VERB 33 and press ENTR pushbutton on DSKY.			
154. When VERB 06 NOUN 66 flash, the horizontal component of earth rate on the X, Y, and Z IRIG's will be displayed in Row 2. Record indication.			
155. Connect the input bus to the DVM by setting the CROSSBAR CONTROL on the Primary Signal Selector panel to 173.			
156. Adjust the G&N POWER ADJUST control on the Test Control panel until the DVM indicates an input bus voltage of 33.5 (+0, -0.25) vdc. Record indication.			

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SUBSYSTEM LEM G & N SYSTEM		ASSY
MANUAL LOAD PROCEDURES		
157. Enter VERB 36 and press ENTR pushbutton on DSKY.		
158. Perform following DSKY operations:		
a. VERB 21 NOUN 27 ENTR		
b. Observe:		
VERB 21 NOUN 27 Flashing		
c. 77767		
Allow test to run 5 minutes. Record any failures indicated by VERB 05 NOUN 31 being displayed on DSKY. If no failure occurs, write "none" on data sheet.		
159. Perform following DSKY operations:		
a. VERB 57		
b. Observe:		
VERB 21 NOUN 01 Flashing		
c. 00004		
d. Observe:		
VERB 16 NOUN 20 Displayed		
e. VERB 34		

160. In approximately 12 minutes, VERB 06 NOUN 66 will flash. Local gravity as measured by X, Y, and Z PIPA's will be displayed in Row 1 and Row 2. Record indications.
161. Enter VERB 33 and press ENTR pushbutton on DSKY.
162. When VERB 06 NOUN 66 flash, the horizontal component of earth rate on the X, Y, and Z IRIG's will be displayed in Row 2. Record indication.
163. Enter VERB 36 and press ENTR pushbutton on DSKY.

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SUBSYSTEM LEM G & N SYSTEM		ASSY
MANUAL LOAD PROCEDURES		
164. Connect the input bus to the DVM by setting the CROSSBAR CONTROL on the Primary Signal Selector panel to 173.		
165. Adjust the G&N POWER ADJUST control on the Test Control panel until the DVM indicates an input bus voltage of 28.0 (+0.25) vdc.		

166. Press to extinguish POSITIVE, NEGATIVE, and TAPE READER pushbuttons on XY Interface panel. Set AGC INPUT COUNTERS switch to 1.
167. Press MONITOR pushbutton on Programmer and Monitor panel. MONITOR pushbutton shall light. AGC INPUT-CTR pushbutton shall go out. Press to extinguish TAPE FREE RUN pushbutton.
168. Set AGREEMENT A and B switches on Logic Drawer No. 2 to OFF and then set AGREEMENT A and B digit switches to XXXXXXXX.
169. Press to extinguish CH33-10 pushbutton on RDC Interface panel.
170. Set Power switch on Tape Reader to OFF and remove tape. If alarms occur, press ALARM RESET pushbutton on Programmer and Monitor panel and press RESET pushbutton on DSKY.

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ASSEMBLY UNDER TEST				TEST HISTORY			
TITLE _____		DATE _____		START _____		END _____	
SER. NO. _____ DWG _____ REV. _____		TIME _____		START _____		END _____	
				TOTAL ELAPSED _____			
MAJOR GROUND SUPPORT EQUIPMENT							
NAME _____		SER. NO. _____		CAL DATE _____			
NAME _____		SER. NO. _____		CAL DATE _____			
CONDUCTED BY _____		NAME/AFFILIATION _____		APPROVED BY _____		NAME/AFFILIATION _____	
JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ. ACC	
1 thru 135	Displays	All DSKY character and condition lamps performed as required					
137	LGC self check failures						
141	IMU 28 vdc Bus	vdc	27.75		28.25		
144	gravity	cm/sec <sup>2</sup>	975.0	R1 -----	R2 985.9		
146	Horizontal earth rate (R2)	ERU	See Table 1		See Table 1		
148	IMU 28 vdc Bus	vdc	24.50		24.75		
150	LGC self check failures						
152	gravity	cm/sec <sup>2</sup>	975.0		985.9		
154	Horizontal earth rate (R2)	ERU	See Table 1		See Table 1		

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JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ. ACC
156	IMU 28 vdc Bus	vdc	33.25		33.50	
158	LGC self check failures					
160	gravity	cm/sec <sup>2</sup>	975.0		985.9	
162	Horizontal earth rate (R2)	ERU	See Table 1		See Table 1	

Horizontal Earth Rate Tolerances		
Location	Min Value	Max Value
MIT	00000.64000	00000.84000
AC	00000.64000	00000.84000
MSC	00000.76000	00000.91000
NAA	00000.70000	00000.90000
MILA	00000.79000	00000.91000
GAEC	00000.65750	00000.85750

Table 1

COMMENTS:

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SUBSYSTEM LEM G & N SYSTEM

DESCRIPTION The purpose of this test is to check gross G & N system operations. Computer-DSKY interface is checked by performing a computer controlled DSKY test which verifies correct DSKY character displays. A manual DSKY keyboard test is performed to verify correct key-character display operation. An alarm and interrupts test checks computer

Rev.	Uti.	Date	TDRR NO.	PAGES REVISED	APPROVAL	REFERENCES
A	E-25-66	29177	2-5	All	MM's ACMA	PS 6015000
B	E-21-66	30272	3-4	1	EA 11 MB	IMPORTANT See below.
C	E-4-66	30519	2-5	1	EA 11 MB	IMPORTANT See below.
D	10-06-66	31617	1	1	EA 11 MB	INTERVAL
E	2-2-67	32885	1-5	1	EA 11 MB	INTERVAL
F	7-27-67	34232	1	1	EA 11 MB	INTERVAL
G	8-31-67	34457	3-4-5	1	EA 11 MB	TOOLS AND MATERIAL
H	11-06-67	35185	1-3-5	1	EA 11 MB	See appropriate section of JDC
I	1-11-68	35586	3	All	EA 11 MB	See appropriate section of JDC
J	4-9-68	36044	All	All	EA 11 MB	See appropriate section of JDC
K	7-25-68	36585	2-3	1	EA 11 MB	See appropriate section of JDC
L	10-24-68	36957	All	All	EA 11 MB	See appropriate section of JDC
M	10-24-68	36957	All	All	EA 11 MB	See appropriate section of JDC
N	2-24-69	37364	19	1	EA 11 MB	See appropriate section of JDC

DESCRIPTION (cont)

program error sensing capabilities. Finally a computer controlled test of PIPA and IRIG operation is performed with OG, IG, and MG at 45 degrees. In this position each PIPA LA is sensing some portion of positive g and the accumulative PIPA measurement should be the value of local g. IRIG performance is checked by measuring the effect of the horizontal component of earth rate (cos x) in the same orientation. The IRIG and PIPA test is performed at normal, low, and high prime power levels with the LGC self check being performed concurrently.

IMPORTANT: 1. Obtain the time of day of high order scaler overflow from JDC 12614. To prevent erroneous test results, do not enter a PIPA and IRIG test within 0.2 hour of that time.

VERIFICATION WITH SIDL REQUIRED BEFORE USE

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2. Insure that connector assembly (2003089) is removed and W256-P1 is connected to the LGC test connector before proceeding with this JDC.

3. If the VERB display on the DSKY contains a number from 11 to 17, the KEY REL indicator may flash when DSKY entries are made.

INITIALIZATION

1. Perform JDC 12613 to establish a Master Initialization condition. Insure that the system is in ISS STANDBY with the computer operating and the CGC/LGC POWER ON and 400 CFS POWER ON pushbuttons on the Test Control

panel lighted.

DSKY CHECK

2. Perform following DSKY operations:  
a. VERB 36 ENTR  
b. VERB 21 NOUN 27 ENTR  
c. 00011 ENTR  
3. Observe that all 9's are displayed in the PROG, VERB, NOUN, and Row 1, Row 2, and Row 3 character positions. Check that all applicable electroluminescent elements are lighted. Including the 9's, the following shall be displayed for approximately 5 seconds:

a. 9's  
b. 8's  
c. 7's  
d. 6's  
e. 5's  
f. 4's  
g. 3's  
h. 2's  
i. 1's  
j. 0's  
k. Minus signs in Row 1, Row 2, and Row 3  
l. VERB-NOUN Flashing approx. 5 seconds  
m. COMP ACTY  
n. Plus signs in Row 1, Row 2, and Row 3  
o. VERB-NOUN Flashing approx. 5 seconds  
p. COMP ACTY

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SUBSYSTEM LEM G & N SYSTEM

q. COMP ACTY on for approx. 5 seconds then DSKY blanks

4. Enter VERB 35 and press ENTR pushbutton on DSKY. The following DSKY displays shall illuminate for approximately 5 seconds:

a. UPLINK ACTY  
b. NO ATT  
c. STBY  
d. KEY REL Flashing  
e. TEMP  
f. GIMBAL LOCK  
g. PROG  
h. RESTART  
i. TRACKER  
j. OPR ERR Flashing  
k. VERB-NOUN Flashing  
l. Plus 88888 in Row 1, Row 2, and Row 3

After indications a through k go out, plus 88888's shall remain on Row 1, Row 2, and Row 3 and in VERB-NOUN displays.

MANUAL DSKY OPERATION CHECK

5. Perform following DSKY operations:  
a. VERB 24 NOUN 01 ENTR  
b. Observe:  
VERB 24 NOUN 01 Flashing  
01700 ENTR  
c. Observe:  
VERB 21 NOUN 01 Flashing  
+12345 ENTR

SUBSYSTEM LEM G & N SYSTEM

MANUAL LOAD PROCEDURES

TOOLS AND MATERIAL:

None

ASSY

CTS UPLINK TAPE LOAD PROCEDURES

TOOLS AND MATERIAL:

JDC 12617 CTS UPLINK

Tape, P/N 2801655-001

NOTE: Prepare the LGC for the UPLINK code by establishing the following conditions on the CTS:

a. XY Interface panel -  
Press to light POSITIVE, NEGATIVE, and TAPE READER pushbuttons.  
Set AGC INPUT COUNTERS switch to 9.  
b. Programmer and Monitor panel -  
Press to light AGC INPUT-CTR and TAPE FREE RUN pushbuttons.  
c. Logic Drawer No. 2 -  
Set AGREEMENT B digit switches to X12X3872.  
Set AGREEMENT B switch to STOP.  
d. RDC Interface panel -  
Press to light CH33-10 pushbutton.  
e. Tape Reader -  
Set Power switch to ON.  
Load the CTS UPLINK tape. If alarms occur, press PROCEED and ALARM RESET push-buttons on Programmer

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SUBSYSTEM LEM G & N SYSTEM		ASSY
MANUAL LOAD PROCEDURES		
CTS UPLINK TAPE LOAD PROCEDURES		
and Monitor panel and RSET pushbutton on DSKY.		
f. Programmer and Monitor panel - Press EXECUTE pushbutton. Verify that tape advances to beginning of first UPLINK code. Press EXECUTE pushbutton.		
g. Logic Drawer No. 2 - Verify that AGREEMENT B lamp is not lighted.		
ALARM AND INTERRUPT TEST PARITY FAIL TEST		
8. Perform following DSKY operations:		
a. VERB 36	ENTR	8. Press EXECUTE pushbutton on Programmer and Monitor panel.
b. VERB 21	NOUN 01	8A. When VERB 21 NOUN 01 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.
c. Observe:	NOUN 01	8B. When VERB 27 NOUN 01 flash on DSKY, press EXECUTE pushbutton on Programmer and monitor panel.
d. 01365	ENTR	
e. 00000	ENTR	
f. VERB 27	NOUN 01	
g. Observe:	NOUN 01	
h. 70000	ENTR	

9. Verify that the RESTART condition lamp on the DSKY, PARITY FAIL lamp on Logic Drawer No. 2, and G/N CAUTION lamp on the Monitor panel are lighted. VERB 05 NOUN 31 shall be displayed and Rows 1, 2, and 3 shall indicate 00000 on

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SUBSYSTEM LEM G & N SYSTEM		ASSY
MANUAL LOAD PROCEDURES		
CTS UPLINK TAPE LOAD PROCEDURES		
the DSKY. AGC ALARMS lamp 15 on Logic Drawer No. 1 shall light. AGC ALARMS lamp 2 may light.		
10. Press RSET pushbutton on the DSKY. The RESTART and G/N CAUTION lamps shall go out.		
11. Press ALARM RESET pushbutton on Programmer and Monitor panel. All CTS alarm indications shall go out.		
12. Enter VERB 36 and press ENTR pushbutton on DSKY.		
12. Press EXECUTE pushbutton on Programmer and Monitor panel.		
13. Perform following DSKY operations:		
a. VERB 24	NOUN 01	ENTR
b. Observe:	NOUN 01	Flashing
c. 01600	ENTR	
d. Observe:	NOUN 01	Flashing
e. 30001	ENTR	
f. Observe:	NOUN 01	Flashing
g. 01600	ENTR	
h. VERB 25	NOUN 26	ENTR
i. Observe:	NOUN 26	Flashing
j. VERB 21	ENTR	
k. Observe:	NOUN 26	Flashing
l. 01600	ENTR	
m. Observe:	NOUN 26	Flashing

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SUBSYSTEM LEM G & N SYSTEM		ASSY
MANUAL LOAD PROCEDURES		
CTS UPLINK TAPE LOAD PROCEDURES		
a. 00003	ENTR	
o. VERB 31	ENTR	
14. Verify that RESTART condition lamp on DSKY and G/N CAUTION lamp on Monitor panel are lighted. VERB 05 NOUN 31 shall be displayed and Rows 1, 2, and 3 shall indicate 00000 on DSKY. The AGC ALARMS lamps 1 and 15 on Logic Drawer No. 1 shall be lighted. AGC ALARMS lamp 2 may light.		
15. Press RSET pushbutton on DSKY and ALARM RESET pushbutton on Programmer and Monitor panel. All CTS alarm indications shall go out.		
16. Enter VERB 36 and press ENTR pushbutton on DSKY.		
16. Press EXECUTE pushbutton on Programmer and Monitor panel.		
17. Perform following DSKY operations:		
a. VERB 21	NOUN 27	ENTR
b. 01000	ENTR	
c. VERB 30	ENTR	

18. Verify that RESTART condition lamp on DSKY and G/N CAUTION lamp on Monitor panel are lighted. VERB 05 NOUN 31 shall be displayed and Rows 1, 2, and 3 shall indicate 00000 on DSKY. The AGC ALARMS lamps 5 and 15 on Logic Drawer No. 1 shall be lighted. AGC ALARMS lamp 2 may light.

19. Press RSET pushbutton on DSKY and ALARM RESET pushbutton on Programmer and Monitor panel. All CTS alarm indications shall go out.

20. Enter VERB 36 and press ENTR pushbutton on DSKY.

20. Press EXECUTE pushbutton on Programmer and Monitor panel.

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SUBSYSTEM LEM G & N SYSTEM		ASSY
MANUAL LOAD PROCEDURES		
CTS UPLINK TAPE LOAD PROCEDURES		
TC TRAP TEST		
21. Perform following DSKY operations:		
a. VERB 21	NOUN 02	ENTR
b. Observe:	NOUN 02	Flashing
c. 01600	ENTR	
d. Observe:	NOUN 02	Flashing
e. 01600	ENTR	
f. VERB 25	NOUN 26	ENTR
g. Observe:	NOUN 26	Flashing
h. 04000	ENTR	
i. Observe:	NOUN 26	Flashing
j. 01600	ENTR	
k. Observe:	NOUN 26	Flashing
l. 00003	ENTR	
m. VERB 30	ENTR	

22. Verify that RESTART condition lamp on DSKY and G/N CAUTION lamp on Monitor panel are lighted. VERB 05 NOUN 31 shall be displayed and Rows 1, 2, and 3 shall indicate 00000 on DSKY. The AGC ALARMS lamps 3 and 15 on Logic Drawer No. 1 shall be lighted. AGC ALARMS lamp 2 may light.

23. Press RSET pushbutton on DSKY. Press ALARM RESET pushbutton on Programmer and Monitor panel. All CTS alarm indications shall go out.

24. Enter VERB 36 and press ENTR pushbutton on DSKY.

24. Press EXECUTE pushbutton on Programmer and Monitor panel.

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FORM 00145  
Chg. 7-23-65

SUBSYSTEM	LEM G & N SYSTEM	ASSY
MANUAL LOAD PROCEDURES		
NIGHT WATCHMAN TEST		
25. Perform following DSKY operations:		
a. VERB 24	NOUN 01	ENTR
b. Observe:		
VERB 24	NOUN 01	Flashing
c. 01600		ENTR
d. Observe:		
VERB 21	NOUN 01	Flashing
e. 30001		ENTR
f. Observe:		
VERB 22	NOUN 01	Flashing
g. 01600		ENTR
h. VERB 25	NOUN 26	ENTR
i. Observe:		
VERB 21	NOUN 26	Flashing
j. 03400		ENTR
k. Observe:		
VERB 22	NOUN 26	Flashing
l. 01600		ENTR
m. Observe:		
VERB 23	NOUN 26	Flashing
n. 00003		ENTR
o. VERB 30		ENTR

26. Verify that RESTART condition lamp on DSKY and G/N CAUTION lamp on Monitor panel are lighted. VERB 05 NOUN 31 shall be displayed and Rows 1, 2, and 3 shall indicate 00000 on DSKY. The AGC ALARMS lamps 5 and 15 on Logic Drawer No. 1 shall be lighted. AGC ALARMS lamp 2 may light.

27. Press RSET pushbutton on DSKY and ALARM RESET pushbutton on Programmer

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SUBSYSTEM	LEM G & N SYSTEM	ASSY
MANUAL LOAD PROCEDURES		
CTS UPLINK TAPE LOAD PROCEDURES		
and Monitor panel. All CTS alarm indications shall go out.		
28. Enter VERB 36 and press ENTR pushbutton on DSKY.		
TS/T6 RUPT TEST		
29. Perform following DSKY operations:		
a. VERB 21	NOUN 01	ENTR
b. 01300		ENTR
c. 31304		ENTR
d. NOUN 15		ENTR
e. 00006		ENTR
f. 05013		ENTR
g. 04511		ENTR
h. 40000		ENTR
i. 31312		ENTR
j. 54030		ENTR
k. 31313		ENTR
l. 54345		ENTR
m. 04353		ENTR
n. 36027		ENTR
o. 01314		ENTR
p. 04572		ENTR
q. 00011		ENTR
r. 01300		ENTR
s. VERB 25	NOUN 26	ENTR
t. 01000		ENTR
u. 01305		ENTR
v. 00002		ENTR
w. VERB 21	NOUN 01	ENTR
x. 00031		ENTR
y. 37777		ENTR
z. VERB 11	NOUN 01	ENTR
aa. 00031		ENTR

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SUBSYSTEM	LEM G & N SYSTEM	ASSY
MANUAL LOAD PROCEDURES		
CTS UPLINK TAPE LOAD PROCEDURES		
30. Set AGREEMENT A digitswitches on Logic Drawer No. 2 to XXXX4005. Set AGREEMENT A switch to SAMPLE.		
31. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.		
32. Enter VERB 30 and press ENTR pushbutton on DSKY.		
33. Observe that in approximately 10 seconds the PROG display on the DSKY indicates 11, Row 1 increments to 77777, causing RZ display on Programmer and Monitor panel to indicate 4006.		
34. Perform following DSKY operations:		
a. VERB 36		ENTR
b. VERB 21	NOUN 01	ENTR
c. 00031		ENTR
d. 40000		ENTR
e. VERB 11	NOUN 01	ENTR
f. 00031		ENTR
35. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.		
36. Enter VERB 30 and press ENTR pushbutton on DSKY.		
37. Observe that in approximately 10 seconds the PROG display on the DSKY indicates 11 and Row 1 increments to 77777 causing RZ display on Programmer and Monitor panel to indicate 4006.		
38. When tape stops, set AGREEMENT A digitswitches on Logic Drawer No. 2 to XXXX4045. Set AGREEMENT A switch to OFF and then to SAMPLE. Verify that RG display does not indicate 34062.		
39. Press EXECUTE pushbutton on Programmer and Monitor panel.		
40. When tape stops, set AGREEMENT A digitswitches on Logic Drawer No. 2 to XXXX4045. Set AGREEMENT A switch to OFF and then to SAMPLE. Verify that RG display does not indicate 34062.		
41. Press EXECUTE pushbutton on Programmer and Monitor panel.		
42. Verify that RG display indicates 34062 and PROG lamp on DSKY is lighted. Press RSET pushbutton. PROG lamp shall go out.		
T10 RUPT TEST		
43. Set AGREEMENT A digitswitches on Logic Drawer No. 2 to XXXX4050.		
44. Perform following DSKY operations:		
a. VERB 21	NOUN 01	ENTR
b. 01304		ENTR
c. 04000		ENTR
d. VERB 30		ENTR
45. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.		

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SUBSYSTEM	LEM G & N SYSTEM	ASSY
MANUAL LOAD PROCEDURES		
CTS UPLINK TAPE LOAD PROCEDURES		
38. Enter VERB 36 and press ENTR pushbutton on DSKY.		
RADAR RUPT TEST		
39. Perform following DSKY operations:		
a. VERB 24	NOUN 01	ENTR
b. 01303		ENTR
c. 04353		ENTR
d. 00010		ENTR
e. VERB 22	NOUN 26	ENTR
f. 01300		ENTR
40. Set AGREEMENT A digitswitches on Logic Drawer No. 2 to XXXX4045. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.		
41. Enter VERB 30 and press ENTR pushbutton on DSKY.		
42. Verify that RZ display on Programmer and Monitor panel indicates 4046 and PROG lamp on DSKY is lighted. Press RSET pushbutton. PROG lamp shall go out.		
T10 RUPT TEST		
43. Set AGREEMENT A digitswitches on Logic Drawer No. 2 to XXXX4050.		
44. Press EXECUTE pushbutton on Programmer and Monitor panel.		
45. When tape stops, set AGREEMENT A switch to OFF and then to SAMPLE. Verify that RG display does not indicate 50017.		

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JOB	G & N SYSTEM OPERATIONAL TEST	JDC 12617	REV N	PAGE 17 OF 16
SUBSYSTEM	LEM G & N SYSTEM	ASSY		
	MANUAL LOAD PROCEDURES	CTS UPLINK TAPE LOAD PROCEDURES		
88. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.		88. Set AGREEMENT A switch to OFF and then to SAMPLE. Verify that RG display does not indicate 50017.		
89. Enter VERB 30 and press ENTR pushbutton on DSKY. Verify that RZ display on Programmer and Monitor panel indicates zero.		89. Press EXECUTE pushbutton on Programmer and Monitor panel. Verify that RG display does not indicate 50017.		
90. Press to light CH31-12/IN2-12 pushbutton on RDC Interface panel. Verify that RZ display on Programmer and Monitor panel indicates 4051.		90. Press to light CH31-12/IN2-12 pushbutton on RDC Interface panel. Verify that RG display on Programmer and Monitor panel indicates 50017.		
91. Press to extinguish CH31-12/IN2-12 pushbutton on RDC Interface panel.		91. Press to extinguish CH31-12/IN2-12 pushbutton on RDC Interface panel.		
92. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.		92. Set AGREEMENT A switch to OFF and then to SAMPLE. Verify that RG display does not indicate 50017.		
93. Perform the following DSKY operations:		93. Press EXECUTE pushbutton on Programmer and Monitor panel.		
a. VERB 21 NOUN 01 ENTR				
b. 01304 ENTR				
c. 20000 ENTR				
d. VERB 11 NOUN 10 ENTR				
e. 00032 ENTR				
94. Press to light CH32-1/IN3-1 pushbutton on RDC Interface panel.		94. When tape stops, press to light CH32-1/IN3-1 pushbutton on RDC Interface panel.		
95. Press to extinguish CH32-1/IN3-1 pushbutton on RDC Interface panel. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.		95. Press to extinguish CH32-1/IN3-1 pushbutton on RDC Interface panel. Set AGREEMENT A switch on Logic Drawer No. 2 to OFF and then to SAMPLE. Verify that RG display does not indicate 50017.		

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JOB	G & N SYSTEM OPERATIONAL TEST	JDC 12617 REV N PAGE 18 OF 26
SUBSYSTEM	LEM G & N SYSTEM	ASSY
MANUAL LOAD PROCEDURES		CTS UPLINK TAPE LOAD PROCEDURES
96. Press to light CH32-1/IN3-1 pushbutton on RDC Interface panel. Verify that RZ display on Programmer and Monitor panel indicates zero.		96. Press to light CH32-1/IN3-1 pushbutton on RDC Interface panel. Verify that RG display on Programmer and Monitor panel does not indicate 50017.
97. Enter VERB 30 and press ENTR pushbutton on DSKY. Verify that RZ display on Programmer and Monitor panel indicates 4051.		97. Press EXECUTE pushbutton on Programmer and Monitor panel. Verify that RG display indicates 50017.
98. Press to extinguish CH32-1/IN3-1 pushbutton on RDC Interface panel.		
99. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.		99. Set AGREEMENT A switch to OFF and then to SAMPLE. Verify that RG display does not indicate 50017.
100. Press to light CH32-2/IN3-2 pushbutton on RDC Interface panel. Verify that RZ display on Programmer and Monitor panel indicates zero.		100. Press to light CH32-2/IN3-2 pushbutton on RDC Interface panel. Verify that RG display on Programmer and Monitor panel does not indicate 50017.
101. Enter VERB 30 and press ENTR pushbutton on DSKY. Verify that RZ display on Programmer and Monitor panel indicates 4051.		101. Press EXECUTE pushbutton on Programmer and Monitor panel. Verify that RG display indicates 50017.
102. Press to extinguish CH32-2/IN3-2 pushbutton on RDC Interface panel.		
103. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.		103. Set AGREEMENT A switch to OFF and then to SAMPLE. Verify that RG display does not indicate 50017.
104. Press to light CH32-3/IN3-3 pushbutton on RDC Interface panel. Verify that RZ display on Programmer and Monitor panel indicates zero.		104. Press to light CH32-3/IN3-3 pushbutton on RDC Interface panel. Verify that RG display on Programmer and Monitor panel does not indicate 50017.
105. Enter VERB 30 and press ENTR pushbutton on DSKY. Verify that RZ display on Programmer and Monitor panel indicates 4051.		105. Press EXECUTE pushbutton on Programmer and Monitor panel. Verify that RG display indicates 50017.

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JOB G & N SYSTEM OPERATIONAL TEST		JDC 12617	REV N	PAGE 19 OF 26
SUBSYSTEM	LEM G & N SYSTEM	ASSY		
	MANUAL LOAD PROCEDURES	CTS UPLINK TAPE LOAD PROCEDURES		
106. Press to extinguish CH32-3/IN3-3 pushbutton on RDC Interface panel.				
107. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.		107. Set AGREEMENT A switch to CFF and then to SAMPLE. Verify that RG display does not indicate 50017.		
108. Press to light CH32-4/IN3-4 pushbutton on RDC Interface panel. Verify that RZ display on Programmer and Monitor panel indicates zero.		108. Press to light CH32-4/IN3-4 pushbutton on RDC Interface panel. Verify that RG display on Programmer and Monitor panel does not indicate 50017.		
109. Enter VERB 30 and press ENTR pushbutton on DSKY. Verify that RZ display on Programmer and Monitor panel indicates 4051.		109. Press EXECUTE pushbutton on Programmer and Monitor panel. Verify that RG display indicates 50017.		
110. Press to extinguish CH32-4/IN3-4 pushbutton on RDC Interface panel.				
111. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.		111. Set AGREEMENT A switch to OFF and then to SAMPLE. Verify that RG display does not indicate 50017.		
112. Press to light CH32-5/IN3-5 pushbutton on RDC Interface panel. Verify that RZ display on Programmer and Monitor panel indicates zero.		112. Press to light CH32-5/IN3-5 pushbutton on RDC Interface panel. Verify that RG display on Programmer and Monitor panel does not indicate 50017.		
113. Enter VERB 30 and press ENTR pushbutton on DSKY. Verify that RZ display on Programmer and Monitor panel indicates 4051.		113. Press EXECUTE pushbutton on Programmer and Monitor panel. Verify that RG display indicates 50017.		
114. Press to extinguish CH32-5/IN3-5 pushbutton on RDC Interface panel.				
115. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.		115. Set AGREEMENT A switch to OFF and then to SAMPLE. Verify that RG display does not indicate 50017.		

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JOB G & N SYSTEM OPERATIONAL TEST		JDC 12617	REV N	PAGE 20 OF 26
SUBSYSTEM	LEM G & N SYSTEM	ASSY		
	<u>MANUAL LOAD PROCEDURES</u>			
116. Press to light CH32-6/IN3-6 pushbutton on RDC Interface panel. Verify that RZ display on Programmer and Monitor panel indicates zero.				
117. Enter VERB 30 and press ENTR pushbutton on DSKY. Verify that RZ display on Programmer and Monitor panel indicates 4051.				
118. Press to extinguish CH32-6/IN3-6 pushbutton on RDC Interface panel.				
119. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.				
120. Press to light CH32-7/IN3-7 pushbutton on RDC Interface panel. Verify that RZ display on Programmer and Monitor panel indicates zero.				
121. Enter VERB 30 and press ENTR pushbutton on DSKY. Verify that RZ display on Programmer and Monitor panel indicates 4051.				
122. Press to extinguish CH32-7/IN3-7 pushbutton on RDC Interface panel.				
123. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.				
124. Press to light CH32-8/IN3-8 pushbutton on RDC Interface panel. Verify that RZ display on Programmer and Monitor panel indicates zero.				
125. Enter VERB 30 and press ENTR pushbutton on DSKY. Verify that RZ display on Programmer and Monitor panel indicates 4051.				
<u>CTS UPLINK TAPE LOAD PROCEDURES</u>				
116. Press to light CH32-6/IN3-6 pushbutton on RDC Interface panel. Verify that RZ display on Programmer and Monitor panel does not indicate 50017.				
117. Press EXECUTE pushbutton on Programmer and Monitor panel. Verify that RZ display indicates 50017.				
118. Press to extinguish CH32-6/IN3-6 pushbutton on RDC Interface panel.				
119. Set AGREEMENT A switch to OFF and then to SAMPLE. Verify that RZ display does not indicate 50017.				
120. Press to light CH32-7/IN3-7 pushbutton on RDC Interface panel. Verify that RZ display on Programmer and Monitor panel does not indicate 50017.				
121. Press EXECUTE pushbutton on Programmer and Monitor panel. Verify that RZ display indicates 50017.				
122. Press to extinguish CH32-7/IN3-7 pushbutton on RDC Interface panel.				
123. Set AGREEMENT A switch to OFF and then to SAMPLE. Verify that RZ display does not indicate 50017.				
124. Press to light CH32-8/IN3-8 pushbutton on RDC Interface panel. Verify that RZ display on Programmer and Monitor panel does not indicate 50017.				
125. Press EXECUTE pushbutton on Programmer and Monitor panel. Verify that RZ display indicates 50017.				

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JOB G & N SYSTEM OPERATIONAL TEST			JDC 12617	REV N	PAGE 21 OF 26
SUBSYSTEM LEM G & N SYSTEM		ASSY			
MANUAL LOAD PROCEDURES		CTS UPLINK TAPE LOAD PROCEDURE			
126. Press to extinguish CH32-8/IN3-8 pushbutton on RDC Interface panel.					
127. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.		127. Set AGREEMENT A switch to OFF and then to SAMPLE. Verify that RG display does not indicate 50017.			
128. Press to light CH32-9/IN3-9 pushbutton on RDC Interface panel. Verify that RZ display on Programmer and Monitor panel indicates zero.		128. Press to light CH32-8/IN3-9 pushbutton on RDC Interface panel. Verify that RG display on Programmer and Monitor panel does not indicate 50017.			
129. Enter VERB 30 and press ENTR pushbutton on DSKY. Verify that RZ display on Programmer and Monitor panel indicates 4051.		129. Press EXECUTE pushbutton on Programmer and Monitor panel. Verify that RG display indicates 50017.			
130. Press to extinguish CH32-9/IN3-9 pushbutton on RDC Interface panel.		130. Press EXECUTE pushbutton on Programmer and Monitor panel. Verify that RG display indicates 50017.			
131. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.		131. Set AGREEMENT A switch to OFF and then to SAMPLE. Verify that RG display does not indicate 50017.			
132. Press to light CH32-10/IN3-10 pushbutton on RDC Interface panel. Verify that RZ display on Programmer and Monitor panel indicates zero.		132. Press to light CH32-10/IN3-10 pushbutton on RDC Interface panel. Verify that RG display on Programmer and Monitor panel does not indicate 50017.			
133. Enter VERB 30 and press ENTR pushbutton on DSKY. Verify that RZ display on Programmer and Monitor panel indicates 4051.		133. Press EXECUTE pushbutton on Programmer and Monitor panel. Verify that RG display indicates 50017.			
134. Press to extinguish CH32-10/IN3-10 pushbutton on RDC Interface panel.		134. Press EXECUTE pushbutton on Programmer and Monitor panel. Verify that RG display indicates 50017.			
135. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.		135. Set AGREEMENT A switch to OFF and then to SAMPLE. Verify that RG display does not indicate 50017.			
136. Enter VERB 36 and press ENTR pushbutton on DSKY.		136. Press EXECUTE pushbutton on Programmer and Monitor panel.			

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JOB G & N SYSTEM OPERATIONAL TEST			JDC 12617	REV N	PAGE 22 OF 26
SUBSYSTEM LEM G & N SYSTEM			ASSY		
<u>MANUAL LOAD PROCEDURES</u>			<u>CTS UPLINK TAPE LOAD PROCEDURES</u>		
<u>LGC SELF CHECK</u>			<u>LGC SELF CHECK</u>		
137. Perform following DSKY operations:			137. Set AGREEMENT B switch on Logic		
a. VERB 21 NOUN 27 ENTR			Drawer No. 2 to SAMPLE. Press EXECUTE		
b. Observe:			pushbutton on Programmer and Monitor panel		
VERB 21 NOUN 27 Flashing			137A. When VERB 21 NOUN 27 flash on		
c. 77767			DSKY, press EXECUTE pushbutton on Pro-		
Allow test to run 5 minutes. Record any			grammer and Monitor panel.		
failures indicated by VERB 05 NOUN 31 be-			Allow test to run 5 minutes. Record any		
ing displayed on DSKY. If no failure occurs,			failures indicated by VERB 05 NOUN 31 be-		
write "none" on data sheet.			ing displayed on DSKY. If no failure occurs,		
NOTE: Perform steps 138			write "none" on data sheet.		
through 141 during 5 minute			NOTE: Perform steps 138		
wait of LGC Self Test.			through 141 during 5 minute		
<u>PIPA AND IRIG TEST (Nominal Voltage)</u>			wait of LGC Self Test.		
138. Press ISS OPERATE pushbutton			<u>PIPA AND IRIG TEST (Nominal Voltage)</u>		
on Test Control panel.					
139. Insure that at least 90 seconds have					
elapsed since performing step 138 and that					
the PIPA loops have closed as indicated by					
a butterfly pattern on the PIPA monitor					
scope of the OIA.					
140. Connect the input bus to the Digital					
Voltmeter (DVM) by setting the CROSSBAR					
CONTROL on the Primary Signal Selec-					
tor panel to 173.					
141. Adjust the G&N POWER ADJUST					
control on the Test Control panel until the					
DVM indicates an input bus voltage of					
28.0 (+0.25) vdc. Record indication.					
142. Press ALARM RESET pushbutton					
on Programmer and Monitor panel. Verify					
that AGC ALARMS #6 lamp goes out.					

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JOB G & N SYSTEM OPERATIONAL TEST			JDC 12617 REV N PAGE 23 OF 26
SUBSYSTEM LEM G & N SYSTEM		ASSY	
MANUAL LOAD PROCEDURES			CTS UPLINK TAPE LOAD PROCEDURE 15
143. Perform following DSKY operations:			143. Press EXECUTE pushbutton on Programmer and Monitor panel.
a. VERB 57	ENTR		143A. When VERB 21 NOUN 01 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.
b. Observe:	VERB 21 NOUN 01 Flashing		143B. When VERB 16 NOUN 20 are displayed on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.
c. 00004	ENTR		
d. Observe:	VERB 16 NOUN 20 Displayed		
e. VERB 34	ENTR		
144. In approximately 12 minutes, VERB 06 NOUN 66 will flash. Local gravity as measured by X, Y, and Z PIPA's will be displayed in Row 1 and Row 2. Record indications.			
145. Enter VERB 33 and press ENTR pushbutton on DSKY.			145. Press EXECUTE pushbutton on Programmer and Monitor panel.
146. When VERB 06 NOUN 66 flash, the horizontal component of earth rate on the X, Y, and Z IRIG's will be displayed in Row 2. Record indication.			
PIPA AND IRIG TEST (Low Voltage)		PIPA AND IRIG TEST (Low Voltage)	
147. Connect the input bus to the DVM by setting the CROSSBAR CONTROL on the Primary Signal Selector panel to 173.			
148. Adjust the G&N POWER ADJUST control on the Test Control panel until the DVM indicates an input bus voltage of 24.5 (+0.25, -0) vdc. Record indication.			
149. Enter VERB 36 and press ENTR pushbutton on DSKY.		149. Press EXECUTE pushbutton on Programmer and Monitor panel.	
150. Perform following DSKY operations:		150. Press EXECUTE pushbutton on Programmer and Monitor panel.	
a. VERB 21	NOUN 27 ENTR	150A. When VERB 21 NOUN 27 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.	
b. Observe:	VERB 21 NOUN 27 Flashing		
c. 77767	ENTR		

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JOB G & N SYSTEM OPERATIONAL TEST			JDC 12617	REV N	PAGE 24 OF 26
SUBSYSTEM LEM G & N SYSTEM		ASSY			
MANUAL LOAD PROCEDURES		CTS UPLINK TAPE LOAD PROCEDURES			
Allow test to run 5 minutes. Record any failures indicated by VERB 05 NOUN 31 being displayed on DSKY. If no failure occurs, write "none" on data sheet.		Allow test to run 5 minutes. Record any failures indicated by VERB 05 NOUN 31 being displayed on DSKY. If no failure occurs, write "none" on data sheet.			
151. Perform following DSKY operations:		151. Press EXECUTE pushbutton on Programmer and Monitor panel.			
a. VERB 57	ENTR	151A. When VERB 21 NOUN 01 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.			
b. Observe:					
VERB 21	NOUN 01	Flashing			
c. 00004	ENTR				
d. Observe:					
VERB 16	NOUN 20	Displayed			
e. VERB 34	ENTR	151B. When VERB 16 NOUN 20 are displayed on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.			
152. In approximately 12 minutes, VERB 06 NOUN 66 will flash. Local gravity as measured by X, Y, and Z PIPA's will be displayed in Row 1 and Row 2. Record indications.		152. In approximately 12 minutes, VERB 06 NOUN 66 will flash. Local gravity as measured by X, Y, and Z PIPA's will be displayed in Row 1 and Row 2. Record indications.			
153. Enter VERB 33 and press ENTR pushbutton on DSKY.		153. Press EXECUTE pushbutton on Programmer and Monitor panel.			
154. When VERB 06 NOUN 66 flash, the horizontal component of earth rate on the X, Y, and Z IRIG's will be displayed in Row 2. Record indication.		154. When VERB 06 NOUN 66 flash, the horizontal component of earth rate on the X, Y, and Z IRIG's will be displayed in Row 2. Record indication.			
PIPA AND IRIG TEST (High Voltage) -		PIPA AND IRIG TEST (High Voltage)			
155. Connect the input bus to the DVM by setting the CROSSBAR CONTROL on the Primary Signal Selector panel to 173.		155. Connect the input bus to the DVM by setting the CROSSBAR CONTROL on the Primary Signal Selector panel to 173.			
156. Adjust the G&N POWER ADJUST control on the Test Control panel until the DVM indicates an input bus voltage of 33.5 (+0, -0.25) vdc. Record indication.		156. Adjust the G&N POWER ADJUST control on the Test Control panel until the DVM indicates an input bus voltage of 33.5 (+0, -0.25) vdc. Record indication.			

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SUBSYSTEM LEM G & N SYSTEM ASSY

MANUAL LOAD PROCEDURES

157. Enter VERB 36 and press ENTR

158. Perform following DSKY operations:

a. VERB 21 NOUN 27 ENTR

b. Observe:

VERB 21 NOUN 27 Flashing

c. 77767

Allow test to run 5 minutes. Record any failures indicated by VERB 05 NOUN 31 being displayed on DSKY. If no failure occurs, write "none" on data sheet.

159. Perform following DSKY operations:

a. VERB 57 ENTR

b. Observe:

VERB 21 NOUN 01 Flashing

c. 00004

d. Observe:

VERB 16 NOUN 20 Displayed

e. VERB 34

160. In approximately 12 minutes, VERB 06 NOUN 66 will flash. Local gravity as measured by X, Y, and Z PIPA's will be displayed in Row 1 and Row 2. Record indications.

161. Enter VERB 33 and press ENTR

pushbutton on DSKY.

162. When VERB 06 NOUN 66 flash, the horizontal component of earth rate on the X, Y, and Z IRIG's will be displayed in Row 2. Record indication.

163. Enter VERB 36 and press ENTR

pushbutton on DSKY.

161. Press EXECUTE pushbutton on Programmer and Monitor panel.

162. When VERB 06 NOUN 66 flash, the horizontal component of earth rate on the X, Y, and Z IRIG's will be displayed in Row 2. Record indication.

163. Press EXECUTE pushbutton on Programmer and Monitor panel.

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SUBSYSTEM LEM G & N SYSTEM ASSY

MANUAL LOAD PROCEDURES

164. Connect the input bus to the DVM by setting the CROSSBAR CONTROL on the Primary Signal Selector panel to 173.

165. Adjust the G&N POWER ADJUST control on the Test Control panel until the DVM indicates an input bus voltage of 28.0 ( $\pm 0.25$ ) vdc.

166. Press to extinguish POSITIVE, NEGATIVE, and TAPE READER pushbuttons on XY Interface panel. Set AGC INPUT COUNTERS switch to 1.

167. Press MONITOR pushbutton on Programmer and Monitor panel. MONITOR pushbutton shall light AGC INPUT-CTR pushbutton shall go out. Press to extinguish TAPE FREE RUN pushbutton.

168. Set AGREEMENT A and B switches on Logic Drawer No. 2 to OFF and then set AGREEMENT A and B digit switches to XXXXXXXX.

169. Press to extinguish CH33-10 pushbutton on RDC Interface panel.

170. Set Power switch on Tape Reader to OFF and remove tape. If alarms occur, press ALARM RESET pushbutton on Programmer and Monitor panel and press RESET pushbutton on DSKY.

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APOLLO G&N  
EQUIPMENT TEST  
DATA SHEET 1 OF 2

JOB G & N SYSTEM OPERATIONAL TEST

JDC  
NO. 12617  
REV. N  
INITIAL TDRR 27114

ASSEMBLY UNDER TEST		TEST HISTORY			
SER. NO.	DWG	REV	DATE		
		START	END		
		TIME	SITE / LOCAT ON		
		START	END		
		TOTAL ELAPSED			
MAJOR GROUND SUPPORT EQUIPMENT					
NAME _____ SER. NO. _____ CAL DATE _____					
NAME _____ SER. NO. _____ CAL DATE _____					
CONDUCTED BY _____ NAME/AFFILIATION _____ APPROVED BY _____ NAME/AFFILIATION _____					
JDC ITEM NO.	PARAMETER	UNITS	RECORDED VALUE	MAX VALUE	REJ ACC
1 thru Displays	All DSKY character and condition lamps performed as required				
135	LGC self check failures				
141	IMU 28 vdc Bus	vdc	27.75	28.25	
144	gravity	cm/sec <sup>2</sup>	975.0	985.9	
146	Horizontal earth rate (R2)	ERU	See Table 1	See Table 1	
148	IMU 28 vdc Bus	vdc	24.50	24.75	
150	LGC self check failures				
152	gravity	cm/sec <sup>2</sup>	975.0	985.9	
154	Horizontal earth rate (R2)	ERU	See Table 1	See Table 1	

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APOLLO G&N  
EQUIPMENT TEST  
DATA SHEET 2 OF 2

JOB G & N SYSTEM OPERATIONAL TEST

JDC  
NO. 12617  
REV. N

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ ACC
156	IMU 28 vdc Bus	vdc	33.25		33.50	
158	LGC self check failures					
160	gravity	cm/sec <sup>2</sup>	975.0		985.9	
162	Horizontal earth rate (R2)	ERU	See Table 1		See Table 1	

Horizontal Earth Rate Tolerances		
Location	Min Value	Max Value
MIT	00000.64000	00000.84000
AC	00000.64000	00000.84000
MSC	00000.76000	00000.91000
NAA	00000.70000	00000.90000
MILA	00000.79000	00000.91000
GAEC	00000.65750	00000.85750

Table 1

COMMENTS:

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SUBSYSTEM LEM G & N SYSTEM ASSY

DESCRIPTION The purpose of this test is to check gross G & N system operations. Computer-DSKY interface is checked by performing a computer controlled DSKY test which verifies correct DSKY character displays. A manual DSKY keyboard test is performed to verify correct key-character display operation. An alarm and interrupts test checks computer

Rev	Date	NO.	JDC	PAGES REVISED	APPROVAL	REFERENCES
A	2-25-66	28177	2, 5	All	MAN	PS 6015000
B	2-21-66	30272	3, 4	-	MAN	IMPORTANT See below.
C	3-4-66	30519	2, 5	1	EA	INTERVAL
D	10-20-66	31617	1	-	EA	TOOLS AND MATERIAL
E	2-2-67	32885	1, 5	-	EA	See appropriate section of JDC
F	7-27-67	34232	1	-	EA	
G	9-31-67	34457	3, 4, 5	1	EA	
H	11-30-67	35185	1, 3, 5	1	EA	
I	1-11-68	35386	3	All	EA	
J	4-9-68	36044	All	All	EA	
K	7-25-68	36585	2, 3	-	EA	
L	10-24-68	36937	All	All	EA	
M	2-24-69	37364	19	-	EA	
N	3-27-69	37451	4, 10	-	EA	

DESCRIPTION (cont)

program error sensing capabilities. Finally a computer controlled test of PIPA and IRIG operation is performed with OG, IG, and MG at 45 degrees. In this position each PIPA IA is sensing some portion of positive g and the accumulative PIPA measurement should be the value of local g. IRIG performance is checked by measuring the effect of the horizontal component of earth rate (cos x) in the same orientation. The IRIG and PIPA test is performed at normal, low, and high prime power levels with the LGC self check being performed concurrently.

IMPORTANT: 1. Obtain the time of day of high order scaler overflow from JDC 12614. To prevent erroneous test results, do not enter a PIPA and IRIG test within 0.2 hour of that time.

2. Insure that connector assembly (2003089) is removed and W226-P1 is connected to the LGC test connector before proceeding with this JDC.
3. If the VERB display on the DSKY contains a number from 11 to 17, the KEY REL indicator may flash when DSKY entries are made.

INITIALIZATION

1. Perform JDC 12613 to establish a Master Initialization condition. Insure that the system is in ISS STANDBY with the computer operating and the CGC/LGC POWER ON and 400 CPK POWER ON pushbuttons on the Test Control

VERIFICATION WITH SID REQUIRED BEFORE USE

DATE 15 MAR 66

panel lighted.

DSKY CHECK

2. Perform following DSKY operations:
  - a. VERB 36 ENTR
  - b. VERB 21 NOUN 27 ENTR
  - c. 00011 ENTR

3. Observe that all 9's are displayed in the PROG, VERB, NOUN, and Row 1, Row 2, and Row 3 character positions. Check that all applicable electroluminescent elements are lighted. Including the 9's, the following shall be displayed for approximately 5 seconds:

- a. 9's
- b. 8's
- c. 7's
- d. 6's
- e. 5's
- f. 4's
- g. 3's
- h. 2's
- i. 1's
- j. 0's

Minus signs in Row 1, Row 2, and Row 3

1. VERB-NOUN Flashing approx. 5 seconds

m. COMP ACTY

n. Plus signs in Row 1, Row 2, and Row 3

o. VERB-NOUN Flashing approx. 5 seconds

p. COMP ACTY

on concur-

rently for

approx. 5

seconds

on concur-

rently for

approx. 5

seconds

on concur-

rently for

approx. 5

seconds

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q. COMP ACTY on for approx. 5 seconds then DSKY blanks

f. Observe: VERB 22 NOUN 01 Flashing g. -67890 Do NOT press ENTR 6. Observe that Row 1 contains +12345 and that Row 2 contains -67890.

7. Press CLR pushbutton twice on DSKY. Observe that Row 1 and Row 2 are blank.

NOTE: 1. The remainder of this JDC contains two separate procedures. Perform the procedures contained in the right column of each page if a CTS UPLINK tape is being used. Perform the procedures contained in the left column of each page if a CTS UPLINK tape is NOT being used. Do not interchange steps of columns.

2. The UPLINK ACTY lamp on the DSKY will light during performance of the CTS UPLINK Tape Load Procedures in this JDC.

After indications a through k go out, plus 88888's shall remain on Row 1, Row 2, and Row 3 and in VERB-NOUN displays.

MANUAL DSKY OPERATION CHECK

5. Perform following DSKY operations:

a. VERB 24 NOUN 01 ENTR

b. Observe: VERB 24 NOUN 01 Flashing ENTR

c. 01700

d. Observe: VERB 21 NOUN 01 Flashing ENTR

e. +12345

on concur-

rently for

approx. 5

seconds

on concur-

rently for

approx. 5

seconds

on concur-

rently for

approx. 5

seconds

on concur-

rently for

approx. 5

seconds

on concur-

rently for

approx. 5

seconds

on concur-

rently for

approx. 5

seconds

on concur-

rently for

approx. 5

seconds

on concur-

rently for

approx. 5

seconds

on concur-

rently for

approx. 5

seconds

on concur-

rently for

approx. 5

seconds

on concur-

rently for

approx. 5

seconds

on concur-

rently for

MANUAL LOAD PROCEDURES

TOOLS AND MATERIAL:

None

CTS UPLINK TAPE LOAD PROCEDURES

TOOLS AND MATERIAL:

JDC 12617 CTS UPLINK

Tape, P/N 2801655-002

NOTE: Prepare the LGC for the UPLINK code by establishing the following conditions on the CTS:

a. XY Interface panel -

Press to light POSITIVE, NEGATIVE, and TAPE

READER pushbuttons.

Set AGC INPUT COUNTERS switch to 9.

b. Programmer and Monitor panel -

Press to light AGC

INPUT-CTR and TAPE

FREE RUN pushbuttons.

c. Logic Drawer No. 2 -

Set AGREEMENT B

digit switches to X12X3672.

Set AGREEMENT B

switch to STOP.

d. RDC Interface panel -

Press to light CH33-10

pushbutton.

e. Tape Reader -

Set Power switch to ON.

Load the CTS UPLINK

tape. If alarms occur,

press PROCEED and

ALARM RESET push-

buttons on Programmer

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SUBSYSTEM LEM G & N SYSTEM	ASSY
MANUAL LOAD PROCEDURES	CTS UPLINK TAPE LOAD PROCEDURES and Monitor panel and RSET pushbutton on DSKY.
	f. Programmer and Monitor panel - Press EXECUTE pushbutton. Verify that tape advances to beginning of first UPLINK code. Press EXECUTE pushbutton. g. Logic Drawer No. 2 - Verify that AGREEMENT B lamp is not lighted.
ALARM AND INTERRUPT TEST PARITY FAIL TEST	ALARM AND INTERRUPT TEST PARITY FAIL TEST
8. Perform following DSKY operations: a. VERB 36 b. VERB 21 c. Observe: VERB 21 d. 01365 e. 00000 f. VERB 27 g. Observe: VERB 27 h. 70000	8. Press EXECUTE pushbutton on Programmer and Monitor panel. 8A. When VERB 21 NOUN 01 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel. 8B. When VERB 27 NOUN 01 flash on DSKY, press EXECUTE pushbutton on Programmer and monitor panel.
	9. Verify that the RESTART condition lamp on the DSKY. PARITY FAIL lamp on Logic Drawer No. 2, and G/N CAUTION lamp on the Monitor panel are lighted. VERB 05 NOUN 31 shall be displayed and Rows 1, 2, and 3 shall indicate 00000 on

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SUBSYSTEM LEM G & N SYSTEM	ASSY
MANUAL LOAD PROCEDURES	CTS UPLINK TAPE LOAD PROCEDURES the DSKY. AGC ALARMS lamp 15 on Logic Drawer No. 1 shall light. AGC ALARMS lamp 2 may light. 10. Press RSET pushbutton on the DSKY. The RESTART and G/N CAUTION lamps shall go out. 11. Press ALARM RESET pushbutton on Programmer and Monitor panel. All CTS alarm indications shall go out.
12. Enter VERB 36 and press ENTR pushbutton on DSKY.	12. Press EXECUTE pushbutton on Programmer and Monitor panel.
RUPT LOCK	RUPT LOCK
13. Perform following DSKY operations: a. VERB 24 b. Observe: VERB 24 c. 01600 d. Observe: VERB 21 e. 30001 f. Observe: VERB 22 g. 01600 h. VERB 25 i. Observe: VERB 21 j. 00001 k. Observe: VERB 22 l. 01600 m. Observe: VERB 23	13. Press EXECUTE pushbutton on Programmer and Monitor panel. 13A. When VERB 24 NOUN 01 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel. 13B. When VERB 21 NOUN 01 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel. 13C. When VERB 22 NOUN 01 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel. 13D. When VERB 21 NOUN 26 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel. 13E. When VERB 22 NOUN 26 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel. 13F. When VERB 23 NOUN 26 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

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SUBSYSTEM LEM G & N SYSTEM	ASSY
MANUAL LOAD PROCEDURES	CTS UPLINK TAPE LOAD PROCEDURES
n. 00003 o. VERB 31	14. Verify that RESTART condition lamp on DSKY and G/N CAUTION lamp on Monitor panel are lighted. VERB 05 NOUN 31 shall be displayed and Rows 1, 2, and 3 shall indicate 00000 on DSKY. The AGC ALARMS lamps 1 and 15 on Logic Drawer No. 1 shall be lighted. AGC ALARMS lamp 2 may light. 15. Press RSET pushbutton on DSKY and ALARM RESET pushbutton on Programmer and Monitor panel. All CTS alarm indications shall go out.
16. Enter VERB 36 and press ENTR pushbutton on DSKY.	16. Press EXECUTE pushbutton on Programmer and Monitor panel.
17. Perform following DSKY operations: a. VERB 21 b. 01000 c. VERB 30	17. Press EXECUTE pushbutton on Programmer and Monitor panel.
	18. Verify that RESTART condition lamp on DSKY and G/N CAUTION lamp on Monitor panel are lighted. VERB 05 NOUN 31 shall be displayed and Rows 1, 2, and 3 shall indicate 00000 on DSKY. The AGC ALARMS lamps 5 and 15 on Logic Drawer No. 1 shall be lighted. AGC ALARMS lamp 2 may light. 19. Press RSET pushbutton on DSKY and ALARM RESET pushbutton on Programmer and Monitor panel. All CTS alarm indications shall go out.
20. Enter VERB 36 and press ENTR pushbutton on DSKY.	20. Press EXECUTE pushbutton on Programmer and Monitor panel.

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SUBSYSTEM LEM G & N SYSTEM	ASSY
MANUAL LOAD PROCEDURES	CTS UPLINK TAPE LOAD PROCEDURES
TC TRAP TEST	TC TRAP TEST
21. Perform following DSKY operations: a. VERB 21 b. Observe: VERB 21 c. 01600 d. Observe: VERB 21 e. 01600 f. VERB 25 g. Observe: VERB 21 h. 04000 i. Observe: VERB 22 j. 01600 k. Observe: VERB 23 l. 00003 m. VERB 30	21. Press EXECUTE pushbutton on Programmer and Monitor panel. 21A. When VERB 21 NOUN 02 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel. 21B. When VERB 21 NOUN 02 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel. 21C. When VERB 21 NOUN 26 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel. 21D. When VERB 22 NOUN 26 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel. 21E. When VERB 23 NOUN 26 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.
	22. Verify that RESTART condition lamp on DSKY and G/N CAUTION lamp on Monitor panel are lighted. VERB 05 NOUN 31 shall be displayed and Rows 1, 2, and 3 shall indicate 00000 on DSKY. The AGC ALARMS lamps 3 and 15 on Logic Drawer No. 1 shall be lighted. AGC ALARMS lamp 2 may light. 23. Press RSET pushbutton on DSKY. Press ALARM RESET pushbutton on Programmer and Monitor panel. All CTS alarm indications shall go out.
24. Enter VERB 36 and press ENTR pushbutton on DSKY.	24. Press EXECUTE pushbutton on Programmer and Monitor panel.

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TCNM 00145  
CIS: 7-23-65

JOB G & N SYSTEM OPERATIONAL TEST			JDC 12617 REV P PAGE 9 OF 26
SUBSYSTEM LEM G & N SYSTEM		ASSY	
MANUAL LOAD PROCEDURES		CTS UPLINK TAPE LOAD PROCEDURE 3	
NIGHT WATCHMAN TEST		NIGHT WATCHMAN TEST	
25. Perform following DSKY operations:		25. Press EXECUTE pushbutton on Programmer and Monitor panel.	
a. VERB 24	NOUN 01	ENTR	25A. When VERB 24 NOUN 01 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.
b. Observe:	VERB 24	NOUN 01	Flashing
c. 01600		ENTR	25B. When VERB 21 NOUN 01 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.
d. Observe:	VERB 21	NOUN 01	Flashing
e. 30001		ENTR	25C. When VERB 22 NOUN 01 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.
f. Observe:	VERB 22	NOUN 01	Flashing
g. 01600		ENTR	25D. When VERB 21 NOUN 26 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.
h. VERB 25	NOUN 26	ENTR	25E. When VERB 22 NOUN 26 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.
i. Observe:	VERB 21	NOUN 26	Flashing
j. 03400		ENTR	25F. When VERB 23 NOUN 26 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.
k. Observe:	VERB 22	NOUN 26	Flashing
l. 01600		ENTR	
m. Observe:	VERB 23	NOUN 26	Flashing
n. 00003		ENTR	
o. VERB 30		ENTR	
26. Verify that RESTART condition lamp on DSKY and G/N CAUTION lamp on Monitor panel are lighted. VERB 05 NOUN 31 shall be displayed and Rows 1, 2, and 3 shall indicate 00000 on DSKY. The AGC ALARMS lamps 5 and 15 on Logic Drawer No. 1 shall be lighted. AGC ALARMS lamp 2 may light.		27. Press RSET pushbutton on DSKY and ALARM RESET pushbutton on Programmer	

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JOB G & N SYSTEM OPERATIONAL TEST			JDC 12617 REV P PAGE 10 OF 26
SUBSYSTEM LEM G & N SYSTEM		ASSY	
MANUAL LOAD PROCEDURES		CTS UPLINK TAPE LOAD PROCEDURES	
28. Enter VERB 36 and press ENTR pushbutton on DSKY.		28. Press EXECUTE pushbutton on Programmer and Monitor panel. All CTS alarm indications shall go out.	
29. Perform following DSKY operations:		29. Press EXECUTE pushbutton on Programmer and Monitor panel.	
a. VERB 21	NOUN 01	ENTR	
b. 01300		ENTR	
c. 31304		ENTR	
d. NOUN 15		ENTR	
e. 00006		ENTR	
f. 05013		ENTR	
g. 04511		ENTR	
h. 40000		ENTR	
i. 31312		ENTR	
j. 54030		ENTR	
k. 31313		ENTR	
l. 54345		ENTR	
m. 04353		ENTR	
n. 36027		ENTR	
o. 01314		ENTR	
p. 00006		ENTR	
q. 22012		ENTR	
r. 22016		ENTR	
s. 04572		ENTR	
t. 00011		ENTR	
u. 01300		ENTR	
v. VERB 25	NOUN 26	ENTR	
w. 01000		ENTR	
x. 01305		ENTR	
y. 00002		ENTR	
z. VERB 21	NOUN 01	ENTR	
aa. 00031		ENTR	
ab. 37777		ENTR	
ac. VERB 11	NOUN 01	ENTR	
ad. 00031		ENTR	

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JOB G & N SYSTEM OPERATIONAL TEST			JDC 12617 REV P PAGE 11 OF 26
SUBSYSTEM LEM G & N SYSTEM		ASSY	
MANUAL LOAD PROCEDURES		CTS UPLINK TAPE LOAD PROCEDURE 8	
30. Set AGREEMENT A digitswitches on Logic Drawer No. 2 to XXXX4005. Set AGREEMENT A switch to SAMPLE.		30. When tape stops, set AGREEMENT A digitswitches on Logic Drawer No. 2 to XXXX4005. Set AGREEMENT A switch to SAMPLE.	
31. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.		31. Verify that RG display does not indicate 34055.	
32. Enter VERB 30 and press ENTR pushbutton on DSKY.		32. Press EXECUTE pushbutton on Programmer and Monitor panel.	
33. Observe that in approximately 10 seconds the PROG display on the DSKY indicates 11, Row 1 increments to 77777, causing RZ display on Programmer and Monitor panel to indicate 4006.		33. Observe that in approximately 10 seconds the PROG display on the DSKY indicates 11, Row 1 increments to 77777, causing RG display on Programmer and Monitor panel to indicate 34055.	
34. Perform following DSKY operations:		34. Press EXECUTE pushbutton on Programmer and Monitor panel.	
a. VERB 36		ENTR	
b. VERB 21	NOUN 01	ENTR	
c. 00031		ENTR	
d. 40000		ENTR	
e. VERB 11	NOUN 01	ENTR	
f. 00031		ENTR	
35. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.		35. When tape stops, set AGREEMENT A switch to OFF and then to SAMPLE. Verify that RG display does not indicate 34055.	
36. Enter VERB 30 and press ENTR pushbutton on DSKY.		36. Press EXECUTE pushbutton on Programmer and Monitor panel.	
37. Observe that in approximately 10 seconds the PROG display on the DSKY indicates 11 and Row 1 increments to 77777 causing RZ display on Programmer and Monitor panel to indicate 4006.		37. Observe that in approximately 10 seconds the PROG display on the DSKY indicates 11 and Row 1 increments to 77777 causing RG display on Programmer and Monitor panel to indicate 34055.	

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SUBSYSTEM LEM G & N SYSTEM		ASSY	
MANUAL LOAD PROCEDURES		CTS UPLINK TAPE LOAD PROCEDURES	
38. Enter VERB 36 and press ENTR pushbutton on DSKY.		38. Press EXECUTE pushbutton on Programmer and Monitor panel.	
39. Perform following DSKY operations:		39. Press EXECUTE pushbutton on Programmer and Monitor panel.	
a. VERB 24	NOUN 01	ENTR	
b. 01303		ENTR	
c. 04353		ENTR	
d. 00010		ENTR	
e. VERB 22	NOUN 26	ENTR	
f. 01300		ENTR	
40. Set AGREEMENT A digitswitches on Logic Drawer No. 2 to XXXX4045. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.		40. When tape stops, set AGREEMENT A digitswitches on Logic Drawer No. 2 to XXXX4045. Set AGREEMENT A switch to OFF and then to SAMPLE. Verify that RG display does not indicate 34062.	
41. Enter VERB 30 and press ENTR pushbutton on DSKY.		41. Press EXECUTE pushbutton on Programmer and Monitor panel.	
42. Verify that RZ display on Programmer and Monitor panel indicates 4046 and PROG lamp on DSKY is lighted. Press RSET pushbutton. PROG lamp shall go out.		42. Verify that RG display indicates 34062 and PROG lamp on DSKY is lighted. Press RSET pushbutton. PROG lamp shall go out.	
43. Set AGREEMENT A digitswitches on Logic Drawer No. 2 to XXXX4050.		43. Press EXECUTE pushbutton on Programmer and Monitor panel.	
44. Perform following DSKY operations:		44. Press EXECUTE pushbutton on Programmer and Monitor panel.	
a. VERB 21	NOUN 01	ENTR	
b. 01304		ENTR	
c. 04000		ENTR	
d. VERB 30		ENTR	
45. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.		45. When tape stops, set AGREEMENT A switch to OFF and then to SAMPLE. Verify that RG display does not indicate 50017.	

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JOB	G & N SYSTEM OPERATIONAL TEST	JDC 12617	REV	P	PAGE 13 OF 26
SUBSYSTEM	LEM G & N SYSTEM	ASSY			
	CTS UPLINK TAPE LOAD PROCEDURES				
	46. Press to light CH31-1/IN2-1 pushbutton on RDC Interface panel. Verify that RZ display on Programmer and Monitor panel indicates 4051.				
	47. Press to extinguish CH31-1/IN2-1 pushbutton on RDC Interface panel.				
	48. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.				
	49. Enter VERB 30 and press ENTR pushbutton on DSKY.				
	50. Press to light CH31-2/IN2-2 pushbutton on RDC Interface panel. Verify that RZ display on Programmer and Monitor panel indicates 4051.				
	51. Press to extinguish CH31-2/IN2-2 pushbutton on RDC Interface panel.				
	52. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.				
	53. Enter VERB 30 and press ENTR pushbutton on DSKY.				
	54. Press to light CH31-3/IN2-3 pushbutton on RDC Interface panel. Verify that RZ display on Programmer and Monitor panel indicates 4051.				
	55. Press to extinguish CH31-3/IN2-3 pushbutton on RDC Interface panel.				
	56. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.				
57. Enter VERB 30 and Press ENTR pushbutton on DSKY.					

46. Press to light CH31-1/IN2-1 pushbutton on RDC Interface panel. Verify that RZ display on Programmer and Monitor panel indicates 50017.				
47. Press to extinguish CH31-1/IN2-1 pushbutton on RDC Interface panel.				
48. Set AGREEMENT A switch to OFF and then to SAMPLE. Verify that RZ display does not indicate 50017.				
49. Press EXECUTE pushbutton on Programmer and Monitor panel.				
50. Press to light CH31-2/IN2-2 pushbutton on RDC Interface panel. Verify that RZ display on Programmer and Monitor panel indicates 50017.				
51. Press to extinguish CH31-2/IN2-2 pushbutton on RDC Interface panel.				
52. Set AGREEMENT A switch to OFF and then to SAMPLE. Verify that RZ display does not indicate 50017.				
53. Press EXECUTE pushbutton on Programmer and Monitor panel.				
54. Press to light CH31-3/IN2-3 pushbutton on RDC Interface panel. Verify that RZ display on Programmer and Monitor panel indicates 50017.				
55. Press to extinguish CH31-3/IN2-3 pushbutton on RDC Interface panel.				
56. Set AGREEMENT A switch to OFF and then to SAMPLE. Verify that RZ display does not indicate 50017.				
57. Press EXECUTE pushbutton on Programmer and Monitor panel.				

46. Press to light CH31-1/IN2-1 pushbutton on RDC Interface panel. Verify that RZ display on Programmer and Monitor panel indicates 50017.				
47. Press to extinguish CH31-1/IN2-1 pushbutton on RDC Interface panel.				
48. Set AGREEMENT A switch to OFF and then to SAMPLE. Verify that RZ display does not indicate 50017.				
49. Press EXECUTE pushbutton on Programmer and Monitor panel.				
50. Press to light CH31-2/IN2-2 pushbutton on RDC Interface panel. Verify that RZ display on Programmer and Monitor panel indicates 50017.				
51. Press to extinguish CH31-2/IN2-2 pushbutton on RDC Interface panel.				
52. Set AGREEMENT A switch to OFF and then to SAMPLE. Verify that RZ display does not indicate 50017.				
53. Press EXECUTE pushbutton on Programmer and Monitor panel.				
54. Press to light CH31-3/IN2-3 pushbutton on RDC Interface panel. Verify that RZ display on Programmer and Monitor panel indicates 50017.				
55. Press to extinguish CH31-3/IN2-3 pushbutton on RDC Interface panel.				
56. Set AGREEMENT A switch to OFF and then to SAMPLE. Verify that RZ display does not indicate 50017.				
57. Press EXECUTE pushbutton on Programmer and Monitor panel.				

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SUBSYSTEM	LEM G & N SYSTEM	ASSY			
	MANUAL LOAD PROCEDURES	CTS UPLINK TAPE LOAD PROCEDURES			
58. Press to light CH31-4/IN2-4 pushbutton on RDC Interface panel. Verify that RZ display on Programmer and Monitor panel indicates 4051.		58. Press to light CH31-4/IN2-4 pushbutton on RDC Interface panel. Verify that RG display on Programmer and Monitor panel indicates 50017.			
59. Press to extinguish CH31-4/IN2-4 pushbutton on RDC Interface panel.		60. Set AGREEMENT A switch to OFF and then to SAMPLE. Verify that RG display does not indicate 50017.			
60. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.		61. Press EXECUTE pushbutton on Programmer and Monitor panel.			
61. Enter VERB 30 and press ENTR pushbutton on DSKY.		62. Press to light CH31-5/IN2-5 pushbutton on RDC Interface panel. Verify that RG display on Programmer and Monitor panel indicates 50017.			
62. Press to light CH31-5/IN2-5 pushbutton on RDC Interface panel. Verify that RZ display on Programmer and Monitor panel indicates 4051.		63. Press to extinguish CH31-5/IN2-5 pushbutton on RDC Interface panel.			
64. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.		64. Set AGREEMENT A switch to OFF and then to SAMPLE. Verify that RG display does not indicate 50017.			
65. Enter VERB 30 and press ENTR pushbutton on DSKY.		65. Press EXECUTE pushbutton on Programmer and Monitor panel.			
66. Press to light CH31-6/IN2-6 pushbutton on RDC Interface panel. Verify that RZ display on Programmer and Monitor panel indicates 4051.		66. Press to light CH31-6/IN2-6 pushbutton on RDC Interface panel. Verify that RG display on Programmer and Monitor panel indicates 50017.			
67. Press to extinguish CH31-6/IN2-6 pushbutton on RDC Interface panel.		68. Set AGREEMENT A switch to OFF and then to SAMPLE. Verify that RG display does not indicate 50017.			
68. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.					

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JOB	G & N SYSTEM OPERATIONAL TEST	JDC 12617 REV P PAGE 15 OF 26
SUBSYSTEM	LEM G & N SYSTEM	ASSY
	MANUAL LOAD PROCEDURES	
CTS UPLINK TAPE LOAD PROCEDURES		
69. Perform following DSKY operations:		
a. VERB 21	NOUN 01	ENTR
b. 01304		ENTR
c. 10000		ENTR
d. VERB 30		ENTR
70. Press to light CH31-7/IN2-7 pushbutton on RDC Interface panel. Verify that RZ display on Programmer and Monitor panel indicates 4051.		
71. Press to extinguish CH31-7/IN2-7 pushbutton on RDC Interface panel.		
72. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.		
73. Enter VERB 30 and press ENTR pushbutton on DSKY. Verify that RZ display on Programmer and Monitor panel indicates zero.		
74. Press to light CH31-8/IN2-8 pushbutton on RDC Interface panel. Verify that RZ display on Programmer and Monitor panel indicates 4051.		
75. Press to extinguish CH31-8/IN2-8 pushbutton on RDC Interface panel.		
76. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.		
77. Enter VERB 30 and press ENTR pushbutton on DSKY. Verify that RZ display on Programmer and Monitor panel indicates zero.		
78. Press to light CH31-9/IN2-9 pushbutton on RDC Interface panel. Verify that RG display on Programmer and Monitor panel indicates 50017.		
79. Press to light CH31-9/IN2-9 pushbutton on RDC Interface panel. Verify that RG display does not indicate 50017.		
80. Press to light CH31-9/IN2-9 pushbutton on RDC Interface panel. Verify that RG display on Programmer and Monitor panel indicates 50017.		
81. Press to light CH31-9/IN2-9 pushbutton on RDC Interface panel. Verify that RG display does not indicate 50017.		
82. Press to light CH31-9/IN2-9 pushbutton on RDC Interface panel. Verify that RG display does not indicate 50017.		
83. Press to light CH31-9/IN2-9 pushbutton on RDC Interface panel. Verify that RG display does not indicate 50017.		
84. Press to light CH31-9/IN2-9 pushbutton on RDC Interface panel. Verify that RG display does not indicate 50017.		
85. Press to light CH31-9/IN2-9 pushbutton on RDC Interface panel. Verify that RG display does not indicate 50017.		
86. Press to light CH31-9/IN2-9 pushbutton on RDC Interface panel. Verify that RG display does not indicate 50017.		
87. Press to light CH31-9/IN2-9 pushbutton on RDC Interface panel. Verify that RG display does not indicate 50017.		
88. Press to light CH31-9/IN2-9 pushbutton on RDC Interface panel. Verify that RG display does not indicate 50017.		
89. Press to light CH31-9/IN2-9 pushbutton on RDC Interface panel. Verify that RG display does not indicate 50017.		
90. Press to light CH31-9/IN2-9 pushbutton on RDC Interface panel. Verify that RG display does not indicate 50017.		
91. Press to light CH31-9/IN2-9 pushbutton on RDC Interface panel. Verify that RG display does not indicate 50017.		
92. Press to light CH31-9/IN2-9 pushbutton on RDC Interface panel. Verify that RG display does not indicate 50017.		
93. Press to light CH31-9/IN2-9 pushbutton on RDC Interface panel. Verify that RG display does not indicate 50017.		
94. Press to light CH31-9/IN2-9 pushbutton on RDC Interface panel. Verify that RG display does not indicate 50017.		
95. Press to light CH31-9/IN2-9 pushbutton on RDC Interface panel. Verify that RG display does not indicate 50017.		
96. Press to light CH31-9/IN2-9 pushbutton on RDC Interface panel. Verify that RG display does not indicate 50017.		
97. Press to light CH31-9/IN2-9 pushbutton on RDC Interface panel. Verify that RG display does not indicate 50017.		
98. Press to light CH31-9/IN2-9 pushbutton on RDC Interface panel. Verify that RG display does not indicate 50017.		
99. Press to light CH31-9/IN2-9 pushbutton on RDC Interface panel. Verify that RG display does not indicate 50017.		
100. Press to light CH31-9/IN2-9 pushbutton on RDC Interface panel. Verify that RG display does not indicate 50017.		

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SUBSYSTEM	LEM G & N SYSTEM	ASSY			
	MANUAL LOAD PROCEDURES	CTS UPLINK TAPE LOAD PROCEDURES			
78. Press to light CH31-8/IN2-9 pushbutton on RDC Interface panel. Verify that RZ display on Programmer and Monitor panel indicates 4051.		78. Press to light CH31-9/IN2-9 pushbutton on RDC Interface panel. Verify that RG display on Programmer and Monitor panel indicates 50017.			
79. Press to extinguish CH31-9/IN2-9 pushbutton on RDC Interface panel.		80. Set AGREEMENT A switch to OFF and then to SAMPLE. Verify that RG display does not indicate 50017.			
80. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.		81. Press EXECUTE pushbutton on Programmer and Monitor panel. Verify that RG display does not indicate 50017.			
81. Enter VERB 30 and press ENTR pushbutton on DSKY. Verify that RZ display on Programmer and Monitor panel indicates zero.		82. Press to light CH31-10/IN2-10 pushbutton on RDC Interface panel. Verify that RG display on Programmer and Monitor panel indicates 50017.			
82. Press to light CH31-10/IN2-10 pushbutton on RDC Interface panel. Verify that RZ display on Programmer and Monitor panel indicates 4051.		83. Press to extinguish CH31-10/IN2-10 pushbutton on RDC Interface panel.			
83. Press to extinguish CH31-10/IN2-10 pushbutton on RDC Interface panel.		84. Set AGREEMENT A switch to OFF and then to SAMPLE. Verify that RG display does not indicate 50017.			
84. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.		85. Press EXECUTE pushbutton on Programmer and Monitor panel. Verify that RG display does not indicate 50017.			
85. Enter VERB 30 and press ENTR pushbutton on DSKY. Verify that RZ display on Programmer and Monitor panel indicates zero.		86. Press to light CH31-11/IN2-11 pushbutton on RDC Interface panel. Verify that RG display on Programmer and Monitor panel indicates 50017.			
86. Press to light CH31-11/IN2-11 pushbutton on RDC Interface panel. Verify that RZ display on Programmer and Monitor panel indicates 4051.		87. Press to extinguish CH31-11/IN2-11 pushbutton on RDC Interface panel.			
87. Press to extinguish CH31-11/IN2-11 pushbutton on RDC Interface panel.					

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JOB	G & N SYSTEM OPERATIONAL TEST	JDC 12617 REV P PAGE 21 OF 21
SUBSYSTEM	LEM G & N SYSTEM	ASSY
MANUAL LOAD PROCEDURES	<p>126. Press to extinguish CH32-8/ IN3-8 pushbutton on RDC Interface panel.</p> <p>127. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.</p> <p>128. Press to light CH32-9/ IN3-9 pushbutton on RDC Interface panel. Verify that RZ display on Programmer and Monitor panel indicates zero.</p> <p>129. Enter VERB 30 and press ENTR pushbutton on DSKY. Verify that RZ display on Programmer and Monitor panel indicates 4051.</p> <p>130. Press to extinguish CH32-9/ IN3-9 pushbutton on RDC Interface panel.</p> <p>131. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.</p> <p>132. Press to light CH32-10/ IN3-10 pushbutton on RDC Interface panel. Verify that RZ display on Programmer and Monitor panel indicates zero.</p> <p>133. Enter VERB 30 and press ENTR pushbutton on DSKY. Verify that RZ display on Programmer and Monitor panel indicates 4051.</p> <p>134. Press to extinguish CH32-10/ IN3-10 pushbutton on RDC Interface panel.</p> <p>135. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.</p> <p>136. Enter VERB 36 and press ENTR pushbutton on DSKY.</p>	<p>CTS UPLINK TAPE LOAD PROCEDURES:</p> <p>127. Set AGREEMENT A switch to OFF and then to SAMPLE. Verify that RG display does not indicate 50017.</p> <p>128. Press to light CH32-8/ IN3-9 pushbutton on RDC Interface panel. Verify that RG display on Programmer and Monitor panel does not indicate 50017.</p> <p>129. Press EXECUTE pushbutton on Programmer and Monitor panel. Verify that RG display indicates 50017.</p> <p>131. Set AGREEMENT A switch to OFF and then to SAMPLE. Verify that RG display does not indicate 50017.</p> <p>132. Press to light CH32-10/ IN3-10 pushbutton on RDC Interface panel. Verify that RG display on Programmer and Monitor panel does not indicate 50017.</p> <p>133. Press EXECUTE pushbutton on Programmer and Monitor panel. Verify that RG display indicates 50017.</p> <p>135. Set AGREEMENT A switch to OFF and then to SAMPLE. Verify that RG display does not indicate 50017.</p> <p>136. Press EXECUTE pushbutton on Programmer and Monitor panel.</p>

JOB G & N SYSTEM OPERATIONAL TEST		JDC 12617 REV PAGE 22 OF 26
SUBSYSTEM	LEM G & N SYSTEM	ASSY
<u>MANUAL LOAD PROCEDURES</u> <u>LGC SELF CHECK</u> 137. Perform following DSKY operations: a. VERB 21 NOUN 27 ENTR b. Observe: VERB 21 NOUN 27 Flashing c. 77767 Allow test to run 5 minutes. Record any failures indicated by VERB 05 NOUN 31 being displayed on DSKY. If no failure occurs, write "none" on data sheet. NOTE: Perform steps 138 through 141 during 5 minute wait of LGC Self Test.		<u>CTS UPLINK TAPE LOAD PROCEDURES</u> <u>LGC SELF CHECK</u> 137. Set AGREEMENT B switch on Logic Drawer No. 2 to SAMPLE. Press EXECUTE pushbutton on Programmer and Monitor panel 137A. When VERB 21 NOUN 27 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel. Allow test to run 5 minutes. Record any failures indicated by VERB 05 NOUN 31 being displayed on DSKY. If no failure occurs, write "none" on data sheet. NOTE: Perform steps 138 through 141 during 5 minute wait of LGC Self Test.
<u>PIPA AND IRIG TEST (Nominal Voltage)</u> 138. Press ISS OPERATE pushbutton on Test Control panel. 139. Insure that at least 90 seconds have elapsed since performing step 138 and that the PIPA loops have closed as indicated by a butterfly pattern on the PIPA monitor scope of the OIA. 140. Connect the input bus to the Digital Voltmeter (DVM) by setting the CROSSBAR CONTROL on the Primary Signal Selector panel to 178. 141. Adjust the GEN POWER ADJUST control on the Test Control panel until the DVM indicates an input bus voltage of 28.0 ( $\pm 0.25$ ) vdc. Record indication. 142. Press ALARM RESET pushbutton on Programmer and Monitor panel. Verify that AGC ALARMS #6 lamp goes out.		<u>PIPA AND IRIG TEST (Nominal Voltage)</u>

JOB G & N SYSTEM OPERATIONAL TEST		JDC 12617 REV P PAGE 23 OF 26
SUBSYSTEM LEM G & N SYSTEM MANUAL LOAD PROCEDURES		ASSY
143. Perform following DSKY operations:		CTS UP LINK TAPE LOAD PROCEDURES
a. VERB 57	ENTR	143. Press EXECUTE pushbutton on Programmer and Monitor panel.
b. Observe:		149A. When VERB 21 NOUN 01 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.
c. 00004	ENTR	143B. When VERB 16 NOUN 20 are displayed on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.
d. Observe:		144. In approximately 12 minutes, VERB 06 NOUN 66 will flash. Local gravity as measured by X, Y, and Z PIPA's will be displayed in Row 1 and Row 2. Record indications.
e. VERB 34	ENTR	145. Enter VERB 33 and press ENTR pushbutton on DSKY.
145. Enter VERB 33 and press ENTR pushbutton on DSKY.		145. Press EXECUTE pushbutton on Programmer and Monitor panel.
146. When VERB 06 NOUN 66 flash, the horizontal component of earth rate on the X, Y, and Z IRIG's will be displayed in Row 2. Record indication.		
PIPA AND IRIG TEST (Low Voltage)		PIPA AND IRIG TEST (Low Voltage)
147. Connect the input bus to the DVM by setting the CROSSBAR CONTROL on the Primary Signal Selector panel to 173.		
148. Adjust the G&N POWER ADJUST control on the Test Control panel until the DVM indicates an input bus voltage of 24.5 (+0.25, -0) vdc. Record indication.		
149. Enter VERB 36 and press ENTR pushbutton on DSKY.		149. Press EXECUTE pushbutton on Programmer and Monitor panel.
150. Perform following DSKY operations:		150. Press EXECUTE pushbutton on Programmer and Monitor panel
a. VERB 21	NOUN 27	ENTR
b. Observe:		150A. When VERB 21 NOUN 27 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.
c. 77767	NOUN 27	ENTR

JOB G & N SYSTEM OPERATIONAL TEST		JDC 12617 REV P PAGE 24 OF 26
SUBSYSTEM	LEM G & N SYSTEM	ASSY
<u>MANUAL LOAD PROCEDURES</u>		<u>CTS UPLINK TAPE LOAD PROCEDURES</u>
<p>Allow test to run 5 minutes. Record any failures indicated by VERB 05 NOUN 31 being displayed on DSKY. If no failure occurs, write "none" on data sheet.</p> <p>151. Perform following DSKY operations:</p> <p>a. VERB 57 ENTR</p> <p>b. Observe: VERB 21 NOUN 01 Flashing ENTR</p> <p>c. 00004</p> <p>d. Observe: VERB 16 NOUN 20 Displayed ENTR</p> <p>e. VERB 34</p> <p>152. In approximately 12 minutes, VERB 06 NOUN 66 will flash. Local gravity as measured by X, Y, and Z PIPA's will be displayed in Row 1 and Row 2. Record indications.</p>		<p>Allow test to run 5 minutes. Record any failures indicated by VERB 05 NOUN 31 being displayed on DSKY. If no failure occurs, write "none" on data sheet.</p> <p>151. Press EXECUTE pushbutton on Programmer and Monitor panel.</p> <p>151A. When VERB 21 NOUN 01 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.</p> <p>151B. When VERB 16 NOUN 20 are displayed on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.</p> <p>153. Press EXECUTE pushbutton on Programmer and Monitor panel.</p>
<p>153. Enter VERB 33 and press ENTR pushbutton on DSKY.</p>		<p>154. When VERB 06 NOUN 66 flash, the horizontal component of earth rate on the X, Y, and Z IRIG's will be displayed in Row 2. Record indication.</p>
<u>PIPA AND IRIG TEST (High Voltage)</u>		<u>PIPA AND IRIG TEST (High Voltage)</u>
<p>155. Connect the input bus to the DVM by setting the CROSSBAR CONTROL on the Primary Signal Selector panel to 173.</p> <p>156. Adjust the G&amp;N POWER ADJUST control on the Test Control panel until the DVM indicates an input bus voltage of 33.5 (+0, -0.25) vdc. Record indication.</p>		<p>155. Connect the input bus to the DVM by setting the CROSSBAR CONTROL on the Primary Signal Selector panel to 173.</p> <p>156. Adjust the G&amp;N POWER ADJUST control on the Test Control panel until the DVM indicates an input bus voltage of 33.5 (+0, -0.25) vdc. Record indication.</p>

SUBSYSTEM LEM G & N SYSTEM ASSY

MANUAL LOAD PROCEDURES

157. Enter VERB 36 and press ENTR pushbutton on DSKY.

158. Perform following DSKY operations:

a. VERB 21 NOUN 27 ENTR

b. Observe: VERB 21 NOUN 27 Flashing

c. 77767 ENTR

Allow test to run 5 minutes. Record any failures indicated by VERB 05 NOUN 31 being displayed on DSKY. If no failure occurs, write "none" on data sheet.

159. Perform following DSKY operations:

a. VERB 87 ENTR

b. Observe: VERB 21 NOUN 01 Flashing

c. 00004 ENTR

d. Observe: VERB 16 NOUN 20 Displayed

e. VERB 34 ENTR

160. In approximately 12 minutes, VERB 06 NOUN 66 will flash. Local gravity as measured by X, Y, and Z PIPA's will be displayed in Row 1 and Row 2. Record indications.

161. Enter VERB 33 and press ENTR pushbutton on DSKY.

162. When VERB 06 NOUN 66 flash, the horizontal component of earth rate on the X, Y, and Z IRIG's will be displayed in Row 2. Record indication.

163. Enter VERB 36 and press ENTR pushbutton on DSKY.

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SUBSYSTEM LEM G & N SYSTEM ASSY

MANUAL LOAD PROCEDURES

164. Connect the input bus to the DVM by setting the CROSSBAR CONTROL on the Primary Signal Selector panel to 173.

165. Adjust the G&N POWER ADJUST control on the Test Control panel until the DVM indicates an input bus voltage of 28.0 (+0.25) vdc.

166. Press to extinguish POSITIVE, NEGATIVE, and TAPE READER pushbuttons on XY Interface panel. Set AGC INPUT COUNTERS switch to 1.

167. Press MONITOR pushbutton on Programmer and Monitor panel. MONITOR pushbutton shall light. AGC INPUT-CTR pushbutton shall go out. Press to extinguish TAPE FREE RUN pushbutton.

168. Set AGREEMENT A and B switches on Logic Drawer No. 2 to OFF and then set AGREEMENT A and B digit switches to XXXXXXXX.

169. Press to extinguish CH33-10 pushbutton on RDC Interface panel.

170. Set Power switch on Tape Reader to OFF and remove tape. If alarms occur, press ALARM RESET pushbutton on Programmer and Monitor panel and press RSET pushbutton on DSKY.

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APOLLO G&N  
EQUIPMENT TEST  
DATA SHEET 1 OF 2

JOB G & N SYSTEM OPERATIONAL TEST

TEST HISTORY

TITLE \_\_\_\_\_ DATE START \_\_\_\_\_ END \_\_\_\_\_ SITE / LOCATION \_\_\_\_\_

SER. NO. \_\_\_\_\_ DWG \_\_\_\_\_ REV \_\_\_\_\_ TIME START \_\_\_\_\_ END \_\_\_\_\_ TOTAL ELAPSED \_\_\_\_\_

MAJOR GROUND SUPPORT EQUIPMENT

NAME \_\_\_\_\_ SER. NO. \_\_\_\_\_ CAL DATE \_\_\_\_\_

NAME \_\_\_\_\_ SER. NO. \_\_\_\_\_ CAL DATE \_\_\_\_\_

CONDUCTED BY \_\_\_\_\_ NAME/AFFILIATION \_\_\_\_\_ APPROVED BY \_\_\_\_\_ NAME/AFFILIATION \_\_\_\_\_

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ ACC
1 thru 135	Displays	All DSKY character and condition lamps performed as required				
137	LGC self check failures					
141	IMU 28 vdc Bus	vdc	27.75	R1	28.25	
144	gravity	cm/sec <sup>2</sup>	975.0	R2	985.9	
146	Horizontal earth rate (R2)	ERU	See Table 1		See Table 1	
148	IMU 28 vdc Bus	vdc	24.50		24.75	
150	LGC self check failures					
152	gravity	cm/sec <sup>2</sup>	975.0		985.9	
154	Horizontal earth rate (R2)	ERU	See Table 1		See Table 1	

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EQUIPMENT TEST  
DATA SHEET 2 OF 2

JOB G & N SYSTEM OPERATIONAL TEST

TEST HISTORY

TITLE \_\_\_\_\_ DATE START \_\_\_\_\_ END \_\_\_\_\_ SITE / LOCATION \_\_\_\_\_

SER. NO. \_\_\_\_\_ DWG \_\_\_\_\_ REV \_\_\_\_\_ TIME START \_\_\_\_\_ END \_\_\_\_\_ TOTAL ELAPSED \_\_\_\_\_

MAJOR GROUND SUPPORT EQUIPMENT

NAME \_\_\_\_\_ SER. NO. \_\_\_\_\_ CAL DATE \_\_\_\_\_

NAME \_\_\_\_\_ SER. NO. \_\_\_\_\_ CAL DATE \_\_\_\_\_

CONDUCTED BY \_\_\_\_\_ NAME/AFFILIATION \_\_\_\_\_ APPROVED BY \_\_\_\_\_ NAME/AFFILIATION \_\_\_\_\_

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ ACC
156	IMU 28 vdc Bus	vdc	33.25		33.50	
158	LGC self check failures					
160	gravity	cm/sec <sup>2</sup>	975.0		985.9	
162	Horizontal earth rate (R2)	ERU	See Table 1		See Table 1	

Horizontal Earth Rate Tolerances

Location	Min Value	Max Value
MIT	00000.64000	00000.84000
AC	00000.64000	00000.84000
MSC	00000.76000	00000.91000
NAA	00000.70000	00000.90000
MILA	00000.79000	00000.91000
GAEC	00000.65750	00000.85750

Table 1

COMMENTS:

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SUBSYSTEM LEM G & N SYSTEM									
DESCRIPTION The purpose of this test is to check gross G & N system operations. Computer-DSKY interface is checked by performing a computer controlled DSKY test which verifies correct DSKY character displays. A manual DSKY keyboard test is performed to verify correct key-character display operation. An alarm and interrupts test checks computer									
ASSY.									
REFERENCES									
Rev.	Date	TDRR NO.	PAGES REVISED	APPROVAL	INITIALS	DATE	TIME	DATE	TIME
A	7-25-66	29177	2-5	ALL	MM	AC	MB	PS 6015000	
B	7-21-66	30272	3, 4	-	EA	MB	7	IMPORTANT	See below.
C	8-4-66	30519	2, 5	1	EA	MB	7	IMPORTANT	See below.
D	10-20-66	31617	1	-	EA	MB	7	INTERVAL	
E	2-2-67	32885	1, 5	-	EA	MB	7	INTERVAL	
F	7-27-67	34232	1	-	EA	MB	7	INTERVAL	
G	8-31-67	34457	3, 4, 5	1	EA	MB	7	INTERVAL	
H	11-6-67	35185	1, 3, 5	1	EA	MB	7	TOOLS AND MATERIAL	See appropriate section of JDC
I	1-11-68	35386	3	ALL	EA	MB	7	TOOLS AND MATERIAL	See appropriate section of JDC
J	4-9-68	36044	ALL	ALL	EA	MB	7	TOOLS AND MATERIAL	See appropriate section of JDC
K	7-25-68	36585	2, 3	-	EA	MB	7	TOOLS AND MATERIAL	See appropriate section of JDC
L	10-24-68	36957	ALL	ALL	EA	MB	7	TOOLS AND MATERIAL	See appropriate section of JDC
M	2-24-69	37364	19	-	EA	MB	7	TOOLS AND MATERIAL	See appropriate section of JDC
N	3-27-69	37451	4, 10	-	EA	MB	7	TOOLS AND MATERIAL	See appropriate section of JDC
O	5-26-70	38139	1, 27, 28, 29, 30	2	EA	MB	7	TOOLS AND MATERIAL	See appropriate section of JDC

DESCRIPTION (cont)

program error sensing capabilities. Finally a computer controlled test of PIPA and IRIG operation is performed with OG, IG, and MG at 45 degrees. In this position each PIPA IA is sensing some portion of positive g and the accumulative PIPA measurement should be the value of local g. IRIG performance is checked by measuring the effect of the horizontal component of earth rate (cos x) in the same orientation. The IRIG and PIPA test is performed at normal, low, and high prime power levels with the LGC self check being performed concurrently.

IMPORTANT: 1. Obtain the time of day of high order 12614. To prevent erroneous test results, do not enter a PIPA and IRIG test within 0.2 hour of that time.

2. Insure that connector assembly (2003099) or Restart Monitor module (2899899) is removed and W226-P1 is connected to the LGC test connector before proceeding with this JDC.

3. If the VERB display on the DSKY contains a number from 11 to 17, the KEY REL indicator may flash when DSKY entries are made.

INITIALIZATION

1. Perform JDC 12613 to establish a Master Initialization condition. Insure that the system is in ISS STANDBY with the computer operating and the CGC/LGC POWER ON and 400 CPS POWER ON pushbuttons on the Test Control

VERIFICATION WITH SIDL REQUIRED BEFORE USE

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panel lighted.

DSKY CHECK

2. Perform following DSKY operations:

a. VERB 36 ENTR

b. VERB 21 NOUN 27 ENTR

c. 00011 ENTR

3. Observe that all 9's are displayed in the PROG, VERB, NOUN, and Row 1, Row 2, and Row 3 character positions. Check that all applicable electroluminescent elements are lighted. Including the 9's, the following shall be displayed for approximately 5 seconds:

a. 9's

b. 8's

c. 7's

d. 6's

e. 5's

f. 4's

g. 3's

h. 2's

i. 1's

j. 0's

k. Minus signs in Row 1, Row 2, and Row 3

1. VERB-NOUN Flashing on concurrently for approx. 5 seconds

m. COMP ACTY

n. Plus signs in Row 1, Row 2, and Row 3

o. VERB-NOUN Flashing on concurrently for approx. 5 seconds

p. COMP ACTY

ALARMS #1 - RUPT LOC

ALARMS #2 - CTR FAIL

ALARMS #3 - TC TRAP

ALARMS #4 - OSCILLATOR FAIL

ALARMS #5 - NIGHTWATCH-MAN

ALARMS #6 - PIPA FAIL

ALARMS #7 - VOLTAGE FAIL

ALARMS #8 - SCALER FAIL

ALARMS #9 - WARNING FILTER

ALARMS #12 - DOUBLE SCALER

ALARMS #15 - GOJAM CTS P/N

ALARMS #18 - E-MEM- 2014042-071 only

ORY

PARITY

FAIL

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q. COMP ACTY on for approx. 5 seconds then DSKY blanks

4. Enter VERB 35 and press ENTR pushbutton on DSKY. The following DSKY displays shall illuminate for approximately 5 seconds:

a. UPLINK ACTY

b. NO ATT

c. STBY

d. KEY REL Flashing

e. TEMP

f. GIMBAL LOCK

g. PROG

h. RESTART

i. TRACKER

j. OPR ERR Flashing

k. VERB-NOUN Flashing

1. Plus 88888 in Row 1, Row 2, and Row 3

After indications a through k go out, plus 88888's shall remain on Row 1, Row 2, and Row 3 and in VERB-NOUN displays.

MANUAL DSKY OPERATION CHECK

5. Perform following DSKY operations:

a. VERB 24 NOUN 01 ENTR

b. Observe: VERB 24 NOUN 01 Flashing ENTR

c. 01700

d. Observe: VERB 21 NOUN 01 Flashing ENTR

e. +12345

f. Observe: VERB 22 NOUN 01 Flashing; -87890 Do NOT press ENTR

6. Observe that Row 1 contains +12345 and that Row 2 contains -87890.

7. Press CLR pushbutton twice on DSKY. Observe that Row 1 and Row 2 are blank.

NOTE: 1. The remainder of this JDC contains two separate procedures. Perform the procedures contained in the right column of each page if a CTS UPLINK tape is being used. Perform the procedures contained in the left column of each page if a CTS UPLINK tape is NOT being used. Do not interchange steps of columns.

2. The UPLINK ACTY lamp on the DSKY will light during performance of the CTS UPLINK Tape Load Procedures in this JDC.

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MANUAL LOAD PROCEDURES

TOOLS AND MATERIAL:

None

CTS UPLINK TAPE LOAD PROCEDURES

TOOLS AND MATERIAL:

JDC 12617 CTS UPLINK Tape, P/N 2901655-002

NOTE: Prepare the LGC for the UPLINK code by establishing the following conditions on the CTS:

a. XY Interface panel - Press to light POSITIVE, NEGATIVE, and TAPE READER pushbuttons. Set AGC INPUT COUNTERS switch to 9.

b. Programmer and Monitor panel - Press to light AGC INPUT-CTR and TAPE FREE RUN pushbuttons. Logic Drawer No. 2 - Set AGREEMENT B digit switches to X12X3672. Set AGREEMENT B switch to STOP.

d. RDC Interface panel - Press to light CHS3-10 pushbutton.

e. Tape Reader - Set Power switch to ON. Load the CTS UPLINK tape. If alarms occur, press PROCEED and ALARM RESET pushbuttons on Programmer

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SUBSYSTEM LEM G & N SYSTEM	ASSY
MANUAL LOAD PROCEDURES	CTS UPLINK TAPE LOAD PROCEDURES

and Monitor panel and  
RSET pushbutton on

DSKY.

f. Programmer and Monitor panel -

Press EXECUTE pushbutton. Verify that tape advances to beginning of first UPLINK code.

Press EXECUTE pushbutton.

g. Logic Drawer No. 2 -  
Verify that AGREEMENT  
B lamp is not lighted.

#### ALARM AND INTERRUPT TEST PARITY FAIL TEST

8. Perform following DSKY operations:

a. VERB 36 ENTR

b. VERB 21 NOUN 01 ENTR

c. Observe:  
VERB 21 NOUN 01 Flashing

d. 01365 ENTR

e. 00000 ENTR

f. VERB 27 NOUN 01 ENTR

g. Observe:  
VERB 27 NOUN 01 Flashing

h. 70000 ENTR

9. Verify that the RESTART condition lamp on the DSKY, PARITY FAIL lamp on Logic Drawer No. 2, and G/N CAUTION lamp on the Monitor panel are lighted.

VERB 05 NOUN 31 shall be displayed and

Rows 1, 2, and 3 shall indicate 00000 on

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SUBSYSTEM LEM G & N SYSTEM	ASSY
MANUAL LOAD PROCEDURES	CTS UPLINK TAPE LOAD PROCEDURES

the DSKY. AGC ALARMS lamp 15 on Logic

Drawer No. 1 shall light. AGC ALARMS lamp 2 may light.

10. Press RSET pushbutton on the DSKY.

The RESTART and G/N CAUTION lamps shall go out.

11. Press ALARM RESET pushbutton on Programmer and Monitor panel. All CTS alarm indications shall go out.

12. Enter VERB 36 and press ENTR pushbutton on DSKY.

12. Press EXECUTE pushbutton on Programmer and Monitor panel.

12. Press EXECUTE pushbutton on Programmer and Monitor panel.

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12. Press EXECUTE pushbutton on Programmer and Monitor panel.

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SUBSYSTEM LEM G & N SYSTEM	ASSY
MANUAL LOAD PROCEDURES	CTS UPLINK TAPE LOAD PROCEDURES

n. 00003 ENTR

o. VERB 31 ENTR

14. Verify that RESTART condition lamp on DSKY and G/N CAUTION lamp on Monitor panel are lighted. VERB 05 NOUN 31 shall be displayed and Rows 1, 2, and 3 shall indicate 00000 on DSKY. The AGC ALARMS lamps 1 and 15 on Logic Drawer No. 1 shall be lighted. AGC ALARMS lamp 2 may light.

15. Press RSET pushbutton on DSKY and ALARM RESET pushbutton on Programmer and Monitor panel. All CTS alarm indications shall go out.

16. Enter VERB 36 and press ENTR pushbutton on DSKY.

17. Perform following DSKY operations:

a. VERB 21 NOUN 27 ENTR

b. 01000 ENTR

c. VERB 30 ENTR

18. Verify that RESTART condition lamp on DSKY and G/N CAUTION lamp on Monitor panel are lighted. VERB 05 NOUN 31 shall be displayed and Rows 1, 2, and 3 shall indicate 00000 on DSKY. The AGC ALARMS lamps 5 and 15 on Logic Drawer No. 1 shall be lighted. AGC ALARMS lamp 2 may light.

19. Press RSET pushbutton on DSKY and ALARM RESET pushbutton on Programmer and Monitor panel. All CTS alarm indications shall go out.

20. Enter VERB 36 and press ENTR pushbutton on DSKY.

20. Press EXECUTE pushbutton on Programmer and Monitor panel.

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SUBSYSTEM LEM G & N SYSTEM	ASSY
MANUAL LOAD PROCEDURES	CTS UPLINK TAPE LOAD PROCEDURES

TC TRAP TEST

21. Perform following DSKY operations:

a. VERB 21 NOUN 02 ENTR

b. Observe:  
VERB 21 NOUN 02 Flashing

c. 01600 ENTR

d. Observe:  
VERB 21 NOUN 02 Flashing

e. 01600 ENTR

f. VERB 25 NOUN 26 ENTR

g. Observe:  
VERB 21 NOUN 26 Flashing

h. 04000 ENTR

i. Observe:  
VERB 22 NOUN 26 Flashing

j. 01600 ENTR

k. Observe:  
VERB 23 NOUN 26 Flashing

l. 00003 ENTR

m. VERB 30 ENTR

22. Verify that RESTART condition lamp on DSKY and G/N CAUTION lamp on Monitor panel are lighted. VERB 05 NOUN 31 shall be displayed and Rows 1, 2, and 3 shall indicate 00000 on DSKY. The AGC ALARMS lamps 3 and 15 on Logic Drawer No. 1 shall be lighted. AGC ALARMS lamp 2 may light.

23. Press RSET pushbutton on DSKY. Press ALARM RESET pushbutton on Programmer and Monitor panel. All CTS alarm indications shall go out.

24. Enter VERB 36 and press ENTR pushbutton on DSKY.

24. Press EXECUTE pushbutton on Programmer and Monitor panel.

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FORM 00145  
Chg. 7-23-65



JOB G & N SYSTEM OPERATIONAL TEST			JDC 12617 REV R	PAGE 9 OF 30
SUBSYSTEM LEM G & N SYSTEM		ASSY		
MANUAL LOAD PROCEDURES		CTS UPLINK TAPE LOAD PROCEDURES		
NIGHT WATCHMAN TEST		NIGHT WATCHMAN TEST		
25. Perform following DSKY operations:		25. Press EXECUTE pushbutton on Programmer and Monitor panel.		
a. VERB 24	NOUN 01	ENTR		
b. Observe:				
VERB 24	NOUN 01	Flashing		
c. 01600		ENTR		
d. Observe:				
VERB 21	NOUN 01	Flashing		
e. 30001		ENTR		
f. Observe:				
VERB 22	NOUN 01	Flashing		
g. 01600		ENTR		
h. VERB 25	NOUN 26	ENTR		
i. Observe:				
VERB 21	NOUN 26	Flashing		
j. 03400		ENTR		
k. Observe:				
VERB 22	NOUN 26	Flashing		
l. 01600		ENTR		
m. Observe:				
VERB 23	NOUN 26	Flashing		
n. 00003		ENTR		
o. VERB 30		ENTR		

26. Verify that RESTART condition lamp on DSKY and G/N CAUTION lamp on Monitor panel are lighted. VERB 05 NOUN 31 shall be displayed and Rows 1, 2, and 3 shall indicate 00000 on DSKY. The AGC ALARMS lamps 5 and 15 on Logic Drawer No. 1 shall be lighted. AGC ALARMS lamp 2 may light.

27. Press RSET pushbutton on DSKY and ALARM RESET pushbutton on Programmer

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JOB G & N SYSTEM OPERATIONAL TEST			JDC 12617 REV R	PAGE 10 OF 30
SUBSYSTEM LEM G & N SYSTEM		ASSY		
MANUAL LOAD PROCEDURES		CTS UPLINK TAPE LOAD PROCEDURES		
		and Monitor panel. All CTS alarm indications shall go out.		
28. Enter VERB 36 and press ENTR pushbutton on DSKY.		28. Press EXECUTE pushbutton on Programmer and Monitor panel.		
T5/T6 RUPT TEST		T5/T6 RUPT TEST		
29. Perform following DSKY operations:		29. Press EXECUTE pushbutton on Programmer and Monitor panel.		
a. VERB 21	NOUN 01	ENTR		
b. 01300		ENTR		
c. 31304		ENTR		
d. NOUN 15		ENTR		
e. 00006		ENTR ENTR		
f. 05013		ENTR ENTR		
g. 04511		ENTR ENTR		
h. 40000		ENTR ENTR		
i. 31312		ENTR ENTR		
j. 54030		ENTR ENTR		
k. 31313		ENTR ENTR		
l. 54345		ENTR ENTR		
m. 04353		ENTR ENTR		
n. 36027		ENTR ENTR		
o. 01314		ENTR ENTR		
p. 00006		ENTR ENTR		
q. 22012		ENTR ENTR		
r. 22016		ENTR ENTR		
s. 04572		ENTR ENTR		
t. 00011		ENTR ENTR		
u. 01300		ENTR		
v. VERB 25	NOUN 26	ENTR		
w. 01000		ENTR		
x. 01305		ENTR		
y. 00002		ENTR		
z. VERB 21	NOUN 01	ENTR		
aa. 00031		ENTR		
ab. 37777		ENTR		
ac. VERB 11	NOUN 01	ENTR		
ad. 00031		ENTR		

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JOB G & N SYSTEM OPERATIONAL TEST			JDC 12617 REV R	PAGE 11 OF 30
SUBSYSTEM LEM G & N SYSTEM		ASSY		
MANUAL LOAD PROCEDURES		CTS UPLINK TAPE LOAD PROCEDURES		
30. Set AGREEMENT A digitwatches on Logic Drawer No. 2 to XXXX4005. Set AGREEMENT A switch to SAMPLE.		30. When tape stops, set AGREEMENT A digitwatches on Logic Drawer No. 2 to XXXX4005. Set AGREEMENT A switch to SAMPLE.		
31. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.		31. Verify that RG display does not indicate 34055.		
32. Enter VERB 30 and press ENTR pushbutton on DSKY.		32. Press EXECUTE pushbutton on Programmer and Monitor panel.		
33. Observe that in approximately 10 seconds the PROG display on the DSKY indicates 11, Row 1 increments to 77777, causing RZ display on Programmer and Monitor panel to indicate 4006.		33. Observe that in approximately 10 seconds the PROG display on the DSKY indicates 11, Row 1 increments to 77777, causing RG display on Programmer and Monitor panel to indicate 34055.		
34. Perform following DSKY operations:		34. Press EXECUTE pushbutton on Programmer and Monitor panel.		
a. VERB 36		ENTR		
b. VERB 21	NOUN 01	ENTR		
c. 00031		ENTR		
d. 40000		ENTR		
e. VERB 11	NOUN 01	ENTR		
f. 00031		ENTR		
35. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.		35. When tape stops, set AGREEMENT A switch to OFF and then to SAMPLE. Verify that RG display does not indicate 34055.		
36. Enter VERB 30 and press ENTR pushbutton on DSKY.		36. Press EXECUTE pushbutton on Programmer and Monitor panel.		
37. Observe that in approximately 10 seconds the PROG display on the DSKY indicates 11 and Row 1 increments to 77777 causing RZ display on Programmer and Monitor panel to indicate 4006.		37. Observe that in approximately 10 seconds the PROG display on the DSKY indicates 11 and Row 1 increments to 77777 causing RG display on Programmer and Monitor panel to indicate 34055.		

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JOB G & N SYSTEM OPERATIONAL TEST			JDC 12617 REV R	PAGE 12 OF 30
SUBSYSTEM LEM G & N SYSTEM		ASSY		
MANUAL LOAD PROCEDURES		CTS UPLINK TAPE LOAD PROCEDURES		
38. Enter VERB 36 and press ENTR pushbutton on DSKY.		38. Press EXECUTE pushbutton on Programmer and Monitor panel.		
RADAR RUPT TEST		RADAR RUPT TEST		
39. Perform following DSKY operations:		39. Press EXECUTE pushbutton on Programmer and Monitor panel.		
a. VERB 24	NOUN 01	ENTR		
b. 01303		ENTR		
c. 04353		ENTR		
d. 00010		ENTR		
e. VERB 22	NOUN 26	ENTR		
f. 01300		ENTR		
40. Set AGREEMENT A digitwatches on Logic Drawer No. 2 to XXXX4045. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.		40. When tape stops, set AGREEMENT A digitwatches on Logic Drawer No. 2 to XXXX4045. Set AGREEMENT A switch to OFF and then to SAMPLE. Verify that RG display does not indicate 34062.		
41. Enter VERB 30 and press ENTR pushbutton on DSKY.		41. Press EXECUTE pushbutton on Programmer and Monitor panel.		
42. Verify that RZ display on Programmer and Monitor panel indicates 4046 and PROG lamp on DSKY is lighted. Press RSET pushbutton. PROG lamp shall go out.		42. Verify that RG display indicates 34062 and PROG lamp on DSKY is lighted. Press RSET pushbutton. PROG lamp shall go out.		
T10 RUPT TEST		T10 RUPT TEST		
43. Set AGREEMENT A digitwatches on Logic Drawer No. 2 to XXXX4050.		43. Set AGREEMENT A digitwatches on Logic Drawer No. 2 to XXXX4050.		
44. Perform following DSKY operations:		44. Press EXECUTE pushbutton on Programmer and Monitor panel.		
a. VERB 21	NOUN 01	ENTR		
b. 01304		ENTR		
c. 04000		ENTR		
d. VERB 30		ENTR		
45. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.		45. When tape stops, set AGREEMENT A switch to OFF and then to SAMPLE. Verify that RG display does not indicate 50017.		

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JOB	G & N SYSTEM OPERATIONAL TEST	JDC 12617 REV R PAGE 13 OF 30
SUBSYSTEM	LEM G & N SYSTEM	ASSY
MANUAL LOAD PROCEDURES		CTS UPLINK TAPE LOAD PROCEDURES
46. Press to light CH31-1/IN2-1 pushbutton on RDC Interface panel. Verify that RZ display on Programmer and Monitor panel indicates 4051.		46. Press to light CH31-1/IN2-1 pushbutton on RDC Interface panel. Verify that RZ display on Programmer and Monitor panel indicates 50017.
47. Press to extinguish CH31-1/IN2-1 pushbutton on RDC Interface panel.		47. Press to extinguish CH31-1/IN2-1 pushbutton on RDC Interface panel.
48. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.		48. Set AGREEMENT A switch to OFF and then to SAMPLE. Verify that RG display does not indicate 50017.
49. Enter VERB 30 and press ENTR pushbutton on DSKY.		49. Press EXECUTE pushbutton on Programmer and Monitor panel.
50. Press to light CH31-2/IN2-2 pushbutton on RDC Interface panel. Verify that RZ display on Programmer and Monitor panel indicates 4051.		50. Press to light CH31-2/IN2-2 pushbutton on RDC Interface panel. Verify that RG display on Programmer and Monitor panel indicates 50017.
51. Press to extinguish CH31-2/IN2-2 pushbutton on RDC Interface panel.		51. Press to extinguish CH31-2/IN2-2 pushbutton on RDC Interface panel.
52. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.		52. Set AGREEMENT A switch to OFF and then to SAMPLE. Verify that RG display does not indicate 50017.
53. Enter VERB 30 and press ENTR pushbutton on DSKY.		53. Press EXECUTE pushbutton on Programmer and Monitor panel.
54. Press to light CH31-3/IN2-3 pushbutton on RDC Interface panel. Verify that RZ display on Programmer and Monitor panel indicates 4051.		54. Press to light CH31-3/IN2-3 pushbutton on RDC Interface panel. Verify that RZ display on Programmer and Monitor panel indicates 50017.
55. Press to extinguish CH31-3/IN2-3 pushbutton on RDC Interface panel.		55. Press to extinguish CH31-3/IN2-3 pushbutton on RDC Interface panel.
56. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.		56. Set AGREEMENT A switch to OFF and then to SAMPLE. Verify that RG display does not indicate 50017.
57. Enter VERB 30 and Press ENTR pushbutton on DSKY.		57. Press EXECUTE pushbutton on Programmer and Monitor panel.

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JOB	G & N SYSTEM OPERATIONAL TEST	JDC 12617	REV R	PAGE 14	OF 30
SUBSYSTEM		LEM G & N SYSTEM		ASSY	
MANUAL LOAD PROCEDURES		CTS UP/LINK TAPE LOAD PROCEDURES			
58. Press to light CH31-4/ IN2-4 pushbutton on RDC Interface panel. Verify that RZ display on Programmer and Monitor panel indicates 4051.		59. Press to extinguish CH31-4/ IN2-4 pushbutton on RDC Interface panel.		58. Press to light CH31-4/ IN2-4 pushbutton on RDC Interface panel. Verify that RZ display on Programmer and Monitor panel indicates 50017.	
60. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.		60. Set AGREEMENT A switch to OFF and then to SAMPLE. Verify that RG display does not indicate 50017.		61. Press EXECUTE pushbutton on Programmer and Monitor panel.	
61. Enter VERB 30 and press ENTR pushbutton on DSKY.		62. Press to light CH31-5/ IN2-5 pushbutton on RDC Interface panel. Verify that RZ display on Programmer and Monitor panel indicates 4051.		62. Press to light CH31-5/ IN2-5 pushbutton on RDC Interface panel. Verify that RZ display on Programmer and Monitor panel indicates 50017.	
63. Press to extinguish CH31-5/ IN2-5 pushbutton on RDC Interface panel.		64. Set AGREEMENT A switch to OFF and then to SAMPLE. Verify that RG display does not indicate 50017.		65. Press EXECUTE pushbutton on Programmer and Monitor panel.	
64. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.		66. Press to light CH31-6/ IN2-6 pushbutton on RDC Interface panel. Verify that RZ display on Programmer and Monitor panel indicates 4051.		66. Press to light CH31-6/ IN2-6 pushbutton on RDC Interface panel. Verify that RZ display on Programmer and Monitor panel indicates 50017.	
65. Enter VERB 30 and press ENTR pushbutton on DSKY.		67. Press to extinguish CH31-6/ IN2-6 pushbutton on RDC Interface panel.		68. Set AGREEMENT A switch to OFF and then to SAMPLE. Verify that RG display does not indicate 50017.	
66. Press to light CH31-6/ IN2-6 pushbutton on RDC Interface panel. Verify that RZ display on Programmer and Monitor panel indicates 4051.					
68. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.					

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JOB	G & N SYSTEM OPERATIONAL TEST	JDC 12617 REV R PAGE 15 OF 30
SUBSYSTEM	LEM G & N SYSTEM	ASSY
MANUAL LOAD PROCEDURES	<p>69. Perform following DSKY operations:</p> <p>a. VERB 21 NOUN 01 ENTR</p> <p>b. 01304 ENTR</p> <p>c. 10000 ENTR</p> <p>d. VERB 30 ENTR</p> <p>70. Press to light CH31-7/IN2-7 pushbutton on RDC Interface panel. Verify that RZ display on Programmer and Monitor panel indicates 4051.</p> <p>71. Press to extinguish CH31-7/IN2-7 pushbutton on RDC Interface panel.</p> <p>72. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.</p> <p>73. Enter VERB 30 and press ENTR pushbutton on DSKY. Verify that RZ display on Programmer and Monitor panel indicates zero.</p> <p>74. Press to light CH31-8/IN2-8 pushbutton on RDC Interface panel. Verify that RZ display on Programmer and Monitor panel indicates 4051.</p> <p>75. Press to extinguish CH31-8/IN2-8 pushbutton on RDC Interface panel.</p> <p>76. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.</p> <p>77. Enter VERB 30 and press ENTR pushbutton on DSKY. Verify that RZ display on Programmer and Monitor panel indicates zero.</p>	<p>69. Press EXECUTE pushbutton on Programmer and Monitor panel.</p> <p>70. When tape stops, press to light CH31-7/IN2-7 pushbutton on RDC Interface panel. Verify that RG display on Programmer and Monitor panel indicates 50017.</p> <p>71. Press to extinguish CH31-7/IN2-7 pushbutton on RDC Interface panel.</p> <p>72. Set AGREEMENT A switch to OFF and then to SAMPLE. Verify that RG display does not indicate 50017.</p> <p>73. Press EXECUTE pushbutton on Programmer and Monitor panel. Verify that RG display does not indicate 50017.</p> <p>74. Press to light CH31-8/IN2-8 pushbutton on RDC Interface panel. Verify that RG display on Programmer and Monitor panel indicates 50017.</p> <p>75. Press to extinguish CH31-8/IN2-8 pushbutton on RDC Interface panel.</p> <p>76. Set AGREEMENT A switch to OFF and then to SAMPLE. Verify that RG display does not indicate 50017.</p> <p>77. Press EXECUTE pushbutton on Programmer and Monitor panel. Verify that RG display does not indicate 50017.</p>

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JOB	G & N SYSTEM OPERATIONAL TEST	JDC 12617 REV R PAGE 16 OF 30
SUBSYSTEM	LEM G & N SYSTEM	ASSY
CTS UPLINK TAPE LOAD PROCEDURES		
78.	Press to light CH31-9/IN2-9 pushbutton on RDC Interface panel. Verify that RZ display on Programmer and Monitor panel indicates 4051.	78. Press to light CH31-9/IN2-9 pushbutton on RDC Interface panel. Verify that RG display on Programmer and Monitor panel indicates 50017.
79.	Press to extinguish pushbutton on RDC Interface panel.	79. Press to light CH31-9/IN2-9 pushbutton on RDC Interface panel.
80.	Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.	80. Set AGREEMENT A switch to OFF and then to SAMPLE. Verify that RG display does not indicate 50017.
81.	Enter VERB 30 and press ENTR pushbutton on DSKY. Verify that RZ display on Programmer and Monitor panel indicates zero.	81. Press EXECUTE pushbutton on Programmer and Monitor panel. Verify that RG display does not indicate 50017.
82.	Press to light CH31-10/IN2-10 pushbutton on RDC Interface panel. Verify that RZ display on Programmer and Monitor panel indicates 4051.	82. Press to light CH31-10/IN2-10 pushbutton on RDC Interface panel. Verify that RG display on Programmer and Monitor panel indicates 50017.
83.	Press to extinguish pushbutton on RDC Interface panel.	83. Press to light CH31-10/IN2-10 pushbutton on RDC Interface panel.
84.	Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.	84. Set AGREEMENT A switch to OFF and then to SAMPLE. Verify that RG display does not indicate 50017.
85.	Enter VERB 30 and press ENTR pushbutton on DSKY. Verify that RZ display on Programmer and Monitor panel indicates zero.	85. Press EXECUTE pushbutton on Programmer and Monitor panel. Verify that RG display does not indicate 50017.
86.	Press to light CH31-11/IN2-11 pushbutton on RDC Interface panel. Verify that RZ display on Programmer and Monitor panel indicates 4051.	86. Press to light CH31-11/IN2-11 pushbutton on RDC Interface panel. Verify that RG display on Programmer and Monitor panel indicates 50017.
87.	Press to extinguish pushbutton on RDC Interface panel.	87. Press to light CH31-11/IN2-11 pushbutton on RDC Interface panel. Verify that RG display on Programmer and Monitor panel indicates 50017.

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SUBSYSTEM	LEM G & N SYSTEM	ASSY
<b>MANUAL LOAD PROCEDURES</b>		
136. Press to extinguish CH32-8/IN3-8 pushbutton on RDC Interface panel.		
127. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.		
128. Press to light CH32-9/IN3-9 pushbutton on RDC Interface panel. Verify that RZ display on Programmer and Monitor panel indicates zero.		
129. Enter VERB 30 and press ENTR pushbutton on DSKY. Verify that RZ display on Programmer and Monitor panel indicates 4051.		
130. Press to extinguish CH32-9/IN3-9 pushbutton on RDC Interface panel.		
131. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.		
132. Press to light CH32-10/IN3-10 pushbutton on RDC Interface panel. Verify that RZ display on Programmer and Monitor panel indicates zero.		
133. Enter VERB 30 and press ENTR pushbutton on DSKY. Verify that RZ display on Programmer and Monitor panel indicates 4051.		
134. Press to extinguish CH32-10/IN3-10 pushbutton on RDC Interface panel.		
135. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.		
136. Enter VERB 36 and press ENTR pushbutton on DSKY.		

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SUBSYSTEM	LEM G & N SYSTEM	ASSY
<b>MANUAL LOAD PROCEDURES</b>		
137. Perform following DSKY operations:		
a. VERB 21	NOUN 27	ENTR
b. Observe:		
VERB 21	NOUN 27	Flashing
c. 77767		
Allow test to run 5 minutes. Record any failures indicated by VERB 05 NOUN 31 being displayed on DSKY. If no failure occurs, write "none" on data sheet.		
NOTE: Perform steps 138 through 141 during 5 minute wait of LGC Self Test.		
PIPA AND IRIG TEST (Nominal Voltage)		
138. Press ISS OPERATE pushbutton on Test Control panel.		
139. Insure that at least 90 seconds have elapsed since performing step 138 and that the PIPA loops have closed as indicated by a butterfly pattern on the PIPA monitor scope of the OIA.		
140. Connect the input bus to the Digital Voltmeter (DVM) by setting the CROSSBAR CONTROL on the Primary Signal Selector panel to 173.		
141. Adjust the G&N POWER ADJUST control on the Test Control panel until the DVM indicates an input bus voltage of 28.0 (±0.25) vdc. Record indication.		
142. Press ALARM RESET pushbutton on Programmer and Monitor panel. Verify that ACC ALARMS #6 lamp goes out.		

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SUBSYSTEM	LEM G & N SYSTEM	ASSY
<b>MANUAL LOAD PROCEDURES</b>		
143. Perform following DSKY operations:		
a. VERB 57	ENTR	
b. Observe:		
VERB 21	NOUN 01	Flashing
c. 00004	ENTR	
d. Observe:		
VERB 16	NOUN 20	Displayed
e. VERB 34	ENTR	
144. In approximately 12 minutes, VERB 06 NOUN 66 will flash. Local gravity as measured by X, Y, and Z PIPA's will be displayed in Row 1 and Row 2. Record indications.		
145. Enter VERB 33 and press ENTR pushbutton on DSKY.		
146. When VERB 06 NOUN 66 flash, the horizontal component of earth rate on the X, Y, and Z IRIG's will be displayed in Row 2. Record indication.		
PIPA AND IRIG TEST (Low Voltage)		
147. Connect the input bus to the DVM by setting the CROSSBAR CONTROL on the Primary Signal Selector panel to 173.		
148. Adjust the G&N POWER ADJUST control on the Test Control panel until the DVM indicates an input bus voltage of 24.5 (±0.25, -0) vdc. Record indication.		
149. Enter VERB 36 and press ENTR pushbutton on DSKY.		
150. Perform following DSKY operations:		
a. VERB 21	NOUN 27	ENTR
b. Observe:		
VERB 21	NOUN 27	Flashing
c. 77767	ENTR	

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SUBSYSTEM	LEM G & N SYSTEM	ASSY
<b>MANUAL LOAD PROCEDURES</b>		
Allow test to run 5 minutes. Record any failures indicated by VERB 05 NOUN 31 being displayed on DSKY. If no failure occurs, write "none" on data sheet.		
151. Perform following DSKY operations:		
a. VERB 57	ENTR	
b. Observe:		
VERB 21	NOUN 01	Flashing
c. 00004	ENTR	
d. Observe:		
VERB 16	NOUN 20	Displayed
e. VERB 34	ENTR	
152. In approximately 12 minutes, VERB 06 NOUN 66 will flash. Local gravity as measured by X, Y, and Z PIPA's will be displayed in Row 1 and Row 2. Record indications.		
153. Enter VERB 33 and press ENTR pushbutton on DSKY.		
154. When VERB 06 NOUN 66 flash, the horizontal component of earth rate on the X, Y, and Z IRIG's will be displayed in Row 2. Record indication.		
PIPA AND IRIG TEST (High Voltage)		
155. Connect the input bus to the DVM by setting the CROSSBAR CONTROL on the Primary Signal Selector panel to 173.		
156. Adjust the G&N POWER ADJUST control on the Test Control panel until the DVM indicates an input bus voltage of 33.5 (±0, -0.25) vdc. Record indication.		

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JOB G & N SYSTEM OPERATIONAL TEST			JDC 12617	REV R	PAGE 25 OF 30
SUBSYSTEM LEM G & N SYSTEM		ASSY			
MANUAL LOAD PROCEDURES		CTS UPLINK TAPE LOAD PROCEDURES			
157. Enter VERB 36 and press ENTR pushbutton on DSKY.		157. Press EXECUTE pushbutton on Programmer and Monitor panel.			
158. Perform following DSKY operations:		158. Press EXECUTE pushbutton on Programmer and Monitor panel.			
a. VERB 21	NOUN 27	ENTR	158A. When VERB 21 NOUN 27 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.		
b. Observe:	VERB 21	NOUN 27	Allow test to run 5 minutes. Record any failures indicated by VERB 05 NOUN 31 being displayed on DSKY. If no failure occurs, write "none" on data sheet.		
c. 77767	Flashing	ENTR	159. Press EXECUTE pushbutton on Programmer and Monitor panel.		
Allow test to run 5 minutes. Record any failures indicated by VERB 05 NOUN 31 being displayed on DSKY. If no failure occurs, write "none" on data sheet.		159A. When VERB 21 NOUN 01 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.			
159. Perform following DSKY operations:		159B. When VERB 16 NOUN 20 are displayed on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.			
a. VERB 57	ENTR	160. In approximately 12 minutes, VERB 06 NOUN 66 will flash. Local gravity as measured by X, Y, and Z PIPA's will be displayed in Row 1 and Row 2. Record indications.			
b. Observe:	VERB 21	NOUN 01	Flashing	ENTR	161. Press EXECUTE pushbutton on Programmer and Monitor panel.
c. 00004					162. When VERB 06 NOUN 66 flash, the horizontal component of earth rate on the X, Y, and Z IRIG's will be displayed in Row 2. Record indication.
d. Observe:	VERB 16	NOUN 20	Displayed	ENTR	163. Press EXECUTE pushbutton on Programmer and Monitor panel.
e. VERB 34					
161. Enter VERB 33 and press ENTR pushbutton on DSKY.					
163. Enter VERB 36 and press ENTR pushbutton on DSKY.					

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JOB G & N SYSTEM OPERATIONAL TEST		JDC 12617	REV R	PAGE 26 OF 30
SUBSYSTEM LEM G & N SYSTEM		ASSY		
MANUAL LOAD PROCEDURES		CTS UPLINK TAPE LOAD PROCEDURES		
164. Connect the input bus to the DVM by setting the CROSSBAR CONTROL on the Primary Signal Selector panel to 173.		166. Press to extinguish POSITIVE, NEGATIVE, and TAPE READER pushbutton on XY Interface panel. Set AGC INPUT COUNTERS switch to 1.		
165. Adjust the G&N POWER ADJUST control on the Test Control panel until the DVM indicates an input bus voltage of 28.0 ( $\pm 0.25$ ) vdc.		167. Press MONITOR pushbutton on Programmer and Monitor panel. MONITOR pushbutton shall light. AGC INPUT-CTR pushbutton shall go out. Press to extinguish TAPE FREE RUN pushbutton.		
		168. Set AGREEMENT A and B switches on Logic Drawer No. 2 to OFF and then set AGREEMENT A and B digit switches to XXXXXXXX.		
		169. Press to extinguish CH33-10 pushbutton on RDC Interface panel.		
		170. Set Power switch on Tape Reader to OFF and remove tape. If alarms occur, press ALARM RESET pushbutton on Programmer and Monitor panel and press RSET pushbutton on DSKY.		

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JOB G & N SYSTEM OPERATIONAL TEST		JDC 12617	REV R	PAGE 27 OF 30
SUBSYSTEM LEM G & N SYSTEM		ASSY		
MANUAL LOAD PROCEDURES		CTS UPLINK TAPE LOAD PROCEDURES		
		NOTE: The remaining procedures of this JDC apply only when Restart Monitor module (2898989) is installed.		
		171. Downmode the system to OIA On mode according to procedure given in JDC 12614.		
		172. Remove W226-P1 from LGC test connector.		
		CAUTION: Observe marking on Restart Monitor module and insure proper keying when installing.		
		173. Install Restart Monitor module on LGC test connector as follows:		
		a. Carefully locate module on guide pins of LGC test connector maintaining parallelism between module and test connector as closely as possible and engage the four corner jackscrews until finger tight.		
		b. To fully engage module to computer, turn each jackscrew one quarter turn at a time moving around the module in sequence. When fully engaged, torque each jackscrew to $19 \pm 1$ in-lb.		
		174. Advance system to ISS STANDBY mode according to the procedure given in JDC 12614.		
		175. Perform the following DSKY operations:		
		a. VERB 27 NOUN 01 ENTR		
		b. 07700		
		c. Observe that RESTART lamp on the DSKY lights.		
		d. VERB 01 NOUN 10 ENTR		
		e. 00077		
		f. The contents of Row 1 on the DSKY shall be 00001 or 00101.		

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JOB G & N SYSTEM OPERATIONAL TEST		JDC 12617	REV R	PAGE 28 OF 30
SUBSYSTEM LEM G & N SYSTEM		ASSY		
MANUAL LOAD PROCEDURES		CTS UPLINK TAPE LOAD PROCEDURES		
176. Reset contents of Restart Monitor to zero				
by performing DSKY entries as follows:				
a. VERB 21 NOUN 10		ENTR		
b. 00077		ENTR		
c. 00000		ENTR		
d. Press RSET pushbutton.				
177. Perform the following DSKY operations:				
a. VERB 21 NOUN 01		ENTR		
b. 01300		ENTR		
c. 31304		ENTR		
d. NOUN 15		ENTR		
e. 54067		ENTR ENTR		
f. 31305		ENTR ENTR		
g. 54001		ENTR ENTR		
h. 14613		ENTR ENTR		
i. 00067		ENTR		
j. VERB 25 NOUN 26		ENTR		
k. 00001		ENTR		
l. 01300		ENTR		
m. 00000		ENTR		
n. VERB 31		ENTR		
o. Observe that RESTART lamp on DSKY lights				
p. VERB 01 NOUN 10		ENTR		
q. 00077		ENTR		
r. The contents of Row 1 on the DSKY shall be 0004 of 00104.				
178. Reset contents of Restart Monitor to zero by performing DSKY entries as follows:				
a. VERB 21 NOUN 10		ENTR		
b. 00077		ENTR		
c. 00000		ENTR		
d. Press RSET pushbutton				

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MANUAL LOAD PROCEDURES CTS UPLINK TAPE LOAD PROCEDURES

179. Perform the following DSKY operations:

- a. VERB 25 NOUN 01 ENTR
- b. 01300 ENTR
- c. 00004 ENTR
- d. 30067 ENTR
- e. 01300 ENTR
- f. VERB 25 NOUN 26 ENTR
- g. 00001 ENTR
- h. 01300 ENTR
- i. 00000 ENTR
- j. VERB 31 ENTR

k. Observe that the RESTART lamp on DSKY lights

l. VERB 01 NOUN 10 ENTR

m. 00077 ENTR

n. The contents of Row 1 on the DSKY shall

be 00010 or 00110.

180. Reset contents of Restart Monitor to zero by performing DSKY entries as follows:

- a. VERB 21 NOUN 10 ENTR
- b. 00077 ENTR
- c. 00000 ENTR

d. Press RSET pushbutton.

181. Perform the following DSKY operations:

- a. VERB 21 NOUN 01 ENTR
- b. 01300 ENTR
- c. 30000 ENTR
- d. NOUN 15 ENTR
- e. 01300 ENTR
- f. VERB 25 NOUN 26 ENTR
- g. 02000 ENTR
- h. 01300 ENTR
- i. 00000 ENTR
- j. VERB 30 ENTR

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JOB G & N SYSTEM OPERATIONAL TEST

JDC NO. 12617  
REV. R  
INITIAL TDRR 27134

ASSEMBLY UNDER TEST			TEST HISTORY		
TITLE	DATE	START	END	SITE / LOCATION	
SER. NO.	DWG	REV.	TIME	START	END
MAJOR GROUND SUPPORT EQUIPMENT					
NAME SER. NO. CAL. DATE					
NAME SER. NO. CAL. DATE					
CONDUCTED BY NAME/AFFILIATION APPROVED BY NAME/AFFILIATION					
JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE
1 thru 135	Displays	All DSKY character and condition lamps performed as required			
137	LGC self check failures				
141	IMU 28 vdc Bus	vdc	27.75		28.25
144	gravity	cm/sec <sup>2</sup>	975.0		985.9
146	Horizontal earth rate (R2)	ERU	See Table 1		See Table 1
148	IMU 28 vdc Bus	vdc	24.50		24.75
150	LGC self check failures				
152	gravity	cm/sec <sup>2</sup>	975.0		985.9
154	Horizontal earth rate (R2)	ERU	See Table 1		See Table 1

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SUBSYSTEM LEM G & N SYSTEM  
MANUAL LOAD PROCEDURES CTS UPLINK TAPE LOAD PROCEDURES

k. Observe that the RESTART lamp on the DSKY lights in approximately 2 seconds.

- l. VERB 01 NOUN 10 ENTR
- m. 00077 ENTR
- n. The contents of Row 1 on the DSKY shall

be 00020 or 00120.

182. Reset contents of Restart Monitor to zero by performing DSKY entries as follows:

- a. VERB 21 NOUN 10 ENTR
- b. 00077 ENTR
- c. 00000 ENTR

d. Press RSET pushbutton.

183. Set Crossbar Control on OIA to 175 to monitor +28 VDC on the DVM.

184. Using the G&N power ADJUST control on the TEST CONTROL panel, slowly decrease the +28 VDC until the RESTART lamp on the DSKY lights. Return the +28 VDC to 28.0 ± 0.25 VDC.

185. Perform the following DSKY operations:

- a. VERB 01 NOUN 10 ENTR
- b. 00077 ENTR

c. The contents of Row 1 on the DSKY shall be 00XAX, where A can be 4, 5, 6, or 7 due to multiple failures.

186. Reset contents of Restart Monitor to zero by performing DSKY entries as follows:

- a. VERB 21 NOUN 10 ENTR
- b. 00077 ENTR
- c. 00000 ENTR

d. Press RSET pushbutton.

187. Record compliance of DSKY displays for steps 175, 177, 179, 181, and 185.

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JOB G & N SYSTEM OPERATIONAL TEST

JDC NO. 12617  
REV. R

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ ACC
156	IMU 28 vdc Bus	vdc	33.25		33.50	
158	LGC self check failures					
160	gravity	cm/sec <sup>2</sup>	975.0		985.9	
162	Horizontal earth rate (R2)	ERU	See Table 1		See Table 1	
186	Displays			All characters and lamps performed as required.		

Horizontal Earth Rate Tolerances		
Location	Min Value	Max Value
MIT	00000.64000	00000.84000
AC	00000.64000	00000.84000
MSC	00000.76000	00000.91000
NAA	00000.70000	00000.90000
MILA	00000.79000	00000.91000
GAEC	00000.65750	00000.85750

Table 1

COMMENTS:

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SUBSYSTEM LEM G & N SYSTEM  
DESCRIPTION The purpose of this test is to check gross G & N system operations. Computer-DSKY interface is checked by performing a computer controlled DSKY test which verifies correct DSKY character displays. A manual DSKY keyboard test is performed to verify correct key-character display operation. An alarm and interrupt test checks computer

Rev.	Date	TORR NO.	PAGES REVISED	APPROVAL	REFERENCES
A	2-25-66	29177	2-5	ALL	PS 6015000
B	2-21-66	30272	3-4	ALL	IMPORTANT See below.
C	8-4-66	30519	2-5	1	EA 10 MB
D	10-20-66	31617	1	EA 10	INTERVAL
E	2-2-67	32885	1-5	EA 10	TOOLS AND MATERIAL
F	7-27-67	34232	1	EA 10	See appropriate section of JDC
G	8-31-67	34457	3-4, 5	1	EA 10
H	11-30-67	35185	1-3, 5	1	EA 10
I	1-11-68	35386	3	ALL	EA 10
J	4-9-68	36044	ALL	ALL	EA 10
K	7-25-68	36585	2-3	EA 10	EA 10
L	10-24-68	36957	ALL	EA 10	EA 10
M	2-24-69	37364	19	EA 10	EA 10
N	3-27-69	37451	4, 10	EA 10	EA 10
O	5-26-70	38139	1, 27, 28, 29, 30	EA 10	EA 10
P	9-4-70	38203	30	2	JS 10

DESCRIPTION (cont)

program error sensing capabilities. Finally a computer controlled test of PIPA and IRIG operation is performed with OG, IG, and MG at 45 degrees. In this position each PIPA IA is sensing some portion of positive g and the accumulative PIPA measurement should be the value of local g. IRIG performance is checked by measuring the effect of the horizontal component of earth rate (cos x) in the same orientation. The IRIG and PIPA test is performed at normal, low, and high prime power levels with the LGC self check being performed concurrently.

IMPORTANT: 1. Obtain the time of day of high order scalar overflow from JDC 12614. To prevent erroneous test results, do not enter a PIPA and IRIG test within 0.2 hour of that time.

VERIFICATION WITH SID REQUIRED BEFORE USE

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INITIALIZATION  
1. Perform JDC 12613 to establish a Master initialization condition. Insure that the system is in ISS STANDBY with the computer operating and the CGC/LGC POWER ON and 400 CPS POWER ON pushbuttons on the Test Control

2. Insure that connector assembly (2003099) or Restart Monitor module (2898989) is removed and W226-P1 is connected to the LGC test connector before proceeding with this JDC.  
3. If the VERB display on the DSKY contains a number from 11 to 17, the KEY REL indicator may flash when DSKY entries are made.

SUBSYSTEM LEM G & N SYSTEM

panel lighted.

DSKY CHECK

NOTE: 1. Verify that all CTS ALARMS lamps (except #6) are out. If not, press ALARM RESET pushbutton on Programmer and Monitor panel. ALARMS #6 lamp shall remain lighted until completion of step 142.  
2. CTS ALARMS lamps indicate the following alarms when lighted:  
ALARMS #1 - RUPT LOC  
ALARMS #2 - CTR FAIL  
ALARMS #3 - TC TRAP  
ALARMS #4 - OSCILLATOR FAIL  
ALARMS #5 - NIGHTWATCH-MAN  
ALARMS #6 - PIPA FAIL  
ALARMS #7 - VOLTAGE FAIL  
ALARMS #8 - SCALER FAIL  
ALARMS #9 - WARNING FILTER  
ALARMS #12 - DOUBLE SCALER  
ALARMS #15 - GOVAM CTS P/N  
ALARMS #18 - E-MEM- 2014042-ORY 071 only  
PARITY FAIL

2. Perform following DSKY operations:  
a. VERB 36 ENTR  
b. VERB 21, NOUN 27 ENTR  
c. 00011 ENTR  
3. Observe that all 9's are displayed in the PROG, VERB, NOUN, and Row 1, Row 2, and Row 3 character positions. Check that all applicable electroluminescent elements are lighted. Including the 9's, the following shall be displayed for approximately 5 seconds:

a. 9's

b. 8's

c. 7's

d. 6's

e. 5's

f. 4's

g. 3's

h. 2's

i. 1's

j. 0's

k. Minus signs in Row 1, Row 2, and Row 3

l. VERB-NOUN Flashing approx. 5 seconds

m. COMP ACTY

n. Plus signs in Row 1, Row 2, and Row 3

o. VERB-NOUN Flashing approx. 5 seconds

p. COMP ACTY

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q. COMP ACTY

on for approx. 5 seconds then DSKY blanks

ASSY

f. Observe:

VERB 22 NOUN 01 Flashing

g. -67890 Do NOT press ENTR

6. Observe that Row 1 contains +12345 and that Row 2 contains -67890.

7. Press CLR pushbutton twice on DSKY. Observe that Row 1 and Row 2 are blank.

NOTE: 1. The remainder of this JDC contains two separate procedures. Perform the right column of each page if a CTS UPLINK tape is being used. Perform the procedures contained in the left column of each page if a CTS UPLINK tape is NOT being used. Do not interchange steps of columns.

2. The UPLINK ACTY lamp on the DSKY will light during performance of the CTS UPLINK Tape Load Procedures in this JDC.

After indications a through k go out, plus 88888's shall remain on Row 1, Row 2, and Row 3 and in VERB-NOUN displays.

MANUAL DSKY OPERATION CHECK

5. Perform following DSKY operations:

a. VERB 24 NOUN 01 ENTR

b. Observe:

VERB 24 NOUN 01 Flashing ENTR

c. 01700

d. Observe:

VERB 21 NOUN 01 Flashing ENTR

e. +12345

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MANUAL LOAD PROCEDURES

TOOLS AND MATERIAL:

None

CTS UPLINK TAPE LOAD PROCEDURES

JDC 12617 CTS UPLINK

Tape, P/N 2801655-002

NOTE: Prepare the LGC for the UPLINK code by establishing the following conditions on the CTS:

a. XY Interface panel - Press to light POSITIVE, NEGATIVE, and TAPE READER pushbuttons. Set AGC INPUT COUNTERS switch to 9.

b. Programmer and Monitor panel - Press to light AGC INPUT-CTR and TAPE FREE RUN pushbuttons.

c. Logic Drawer No. 2 - Set AGREEMENT B digit switches to X12X3672. Set AGREEMENT B switch to STOP.

d. RDC Interface panel - Press to light CH33-10 pushbutton.

e. Tape Reader - Set Power switch to ON. Load the CTS UPLINK tape. If alarms occur, press PROCEED and ALARM RESET pushbuttons on Programmer



SUBSYSTEM	LEM G & N SYSTEM	ASSY
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## MANUAL LOAD PROCEDURES

CTS UPLINK TAPE LOAD PROCEDURES  
and Monitor panel and  
RSET pushbutton on  
DSKY.

- f. Programmer and Monitor panel -  
Press EXECUTE pushbutton. Verify that tape advances to beginning of first UPLINK code.  
Press EXECUTE pushbutton.

- g. Logic Drawer No. 2 -  
Verify that AGREEMENT  
B lamp is not lighted.

ALARM AND INTERRUPT TEST PARITY  
FAIL TEST

8. Perform following DSKY operations:  
a. VERB 36 ENTR  
b. VERB 21 NOUN 01 ENTR  
c. Observe:  
VERB 21 NOUN 01 Flashing  
d. 01365 ENTR  
e. 00000 ENTR  
f. VERB 27 NOUN 01 ENTR  
g. Observe:  
VERB 27 NOUN 01 Flashing  
h. 70000 ENTR

9. Verify that the RESTART condition lamp on the DSKY, PARITY FAIL lamp on Logic Drawer No. 2, and G/N CAUTION lamp on the Monitor panel are lighted.  
VERB 05 NOUN 31 shall be displayed and Rows 1, 2, and 3 shall indicate 00000 on

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## MANUAL LOAD PROCEDURES

the DSKY. AGC ALARMS lamp 15 on Logic Drawer No. 1 shall light. AGC ALARMS lamp 2 may light.

10. Press RSET pushbutton on the DSKY.  
The RESTART and G/N CAUTION lamps shall go out.

11. Press ALARM RESET pushbutton on Programmer and Monitor panel. All CTS alarm indications shall go out.

12. Enter VERB 36 and press ENTR pushbutton on DSKY.

## RUPT LOCK

13. Press EXECUTE pushbutton on Programmer and Monitor panel.

- a. VERB 24 NOUN 01 ENTR

- b. Observe:  
VERB 24 NOUN 01 Flashing

- c. 01600 ENTR

- d. Observe:  
VERB 21 NOUN 01 Flashing

- e. 30001 ENTR

- f. Observe:  
VERB 22 NOUN 01 Flashing

- g. 01600 ENTR

- h. VERB 25 NOUN 26 ENTR

- i. Observe:  
VERB 21 NOUN 26 Flashing

- j. 00001 ENTR

- k. Observe:  
VERB 22 NOUN 26 Flashing

- l. 01600 ENTR

- m. Observe:  
VERB 23 NOUN 26 Flashing

12. Press EXECUTE pushbutton on Programmer and Monitor panel.

## RUPT LOCK

13. Press EXECUTE pushbutton on Programmer and Monitor panel.

- 13A. When VERB 24 NOUN 01 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

- 13B. When VERB 21 NOUN 01 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

- 13C. When VERB 22 NOUN 01 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

- 13D. When VERB 21 NOUN 26 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

- 13E. When VERB 22 NOUN 26 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

- 13F. When VERB 23 NOUN 26 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

SUBSYSTEM	LEM G & N SYSTEM	ASSY
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## MANUAL LOAD PROCEDURES

CTS UPLINK TAPE LOAD PROCEDURES

- n. 00003 ENTR

- o. VERB 31 ENTR

14. Verify that RESTART condition lamp on DSKY and G/N CAUTION lamp on Monitor panel are lighted. VERB 05 NOUN 31 shall be displayed and Rows 1, 2, and 3 shall indicate 00000 on DSKY. The AGC ALARMS lamps 1 and 15 on Logic Drawer No. 1 shall be lighted. AGC ALARMS lamp 2 may light.

15. Press RSET pushbutton on DSKY and ALARM RESET pushbutton on Programmer and Monitor panel. All CTS alarm indications shall go out.

16. Enter VERB 36 and press ENTR pushbutton on DSKY.

17. Perform following DSKY operations:  
a. VERB 21 NOUN 27 ENTR  
b. 01000 ENTR  
c. VERB 30 ENTR

18. Verify that RESTART condition lamp on DSKY and G/N CAUTION lamp on Monitor panel are lighted. VERB 05 NOUN 31 shall be displayed and Rows 1, 2, and 3 shall indicate 00000 on DSKY. The AGC ALARMS lamps 5 and 15 on Logic Drawer No. 1 shall be lighted. AGC ALARMS lamp 2 may light.

19. Press RSET pushbutton on DSKY and ALARM RESET pushbutton on Programmer and Monitor panel. All CTS alarm indications shall go out.

20. Enter VERB 36 and press ENTR pushbutton on DSKY.

20. Press EXECUTE pushbutton on Programmer and Monitor panel.

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SUBSYSTEM LEM G & N SYSTEM		ASSY		
MANUAL LOAD PROCEDURES		CTS UPLINK TAPE LOAD PROCEDURES		
NIGHT WATCHMAN TEST		NIGHT WATCHMAN TEST		
25. Perform following DSKY operations:		25. Press EXECUTE pushbutton on Programmer and Monitor panel.		
a. VERB 24	NOUN 01	ENTR		
b. Observe:				
VERB 24	NOUN 01	Flashing		
c. 01600		ENTR		
d. Observe:				
VERB 21	NOUN 01	Flashing		
e. 30001		ENTR		
f. Observe:				
VERB 22	NOUN 01	Flashing		
g. 01600		ENTR		
h. VERB 25	NOUN 26	ENTR		
i. Observe:				
VERB 21	NOUN 26	Flashing		
j. 03400		ENTR		
k. Observe:				
VERB 22	NOUN 26	Flashing		
l. 01600		ENTR		
m. Observe:				
VERB 23	NOUN 26	Flashing		
n. 00003		ENTR		
o. VERB 30		ENTR		

26. Verify that RESTART condition lamp on DSKY and G/N CAUTION lamp on Monitor panel are lighted. VERB 05 NOUN 31 shall be displayed and Rows 1, 2, and 3 shall indicate 00000 on DSKY. The AGC ALARMS lamps 5 and 15 on Logic Drawer No. 1 shall be lighted. AGC ALARMS lamp 2 may light.

27. Press RESET pushbutton on DSKY and ALARM RESET pushbutton on Programmer

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MANUAL LOAD PROCEDURES		CTS UPLINK TAPE LOAD PROCEDURES		
TS/TG RUPT TEST		and Monitor panel. All CTS alarm indications shall go out.		
28. Enter VERB 36 and press ENTR pushbutton on DSKY.		28. Press EXECUTE pushbutton on Programmer and Monitor panel.		
29. Perform following DSKY operations:		29. Press EXECUTE pushbutton on Programmer and Monitor panel.		
a. VERB 21	NOUN 01	ENTR		
b. 01300		ENTR		
c. 31304		ENTR		
d. NOUN 15		ENTR		
e. 00006		ENTR ENTR		
f. 05013		ENTR ENTR		
g. 04511		ENTR ENTR		
h. 40000		ENTR ENTR		
i. 31312		ENTR ENTR		
j. 54030		ENTR ENTR		
k. 31313		ENTR ENTR		
l. 54345		ENTR ENTR		
m. 04353		ENTR ENTR		
n. 36027		ENTR ENTR		
o. 01314		ENTR ENTR		
p. 00006		ENTR ENTR		
q. 22012		ENTR ENTR		
r. 22016		ENTR ENTR		
s. 04572		ENTR ENTR		
t. 00011		ENTR ENTR		
u. 01300		ENTR		
v. VERB 25	NOUN 26	ENTR		
w. 01000		ENTR		
x. 01305		ENTR		
y. 00002		ENTR		
z. VERB 21	NOUN 01	ENTR		
aa. 00031		ENTR		
ab. 37777		ENTR		
ac. VERB 11	NOUN 01	ENTR		
ad. 00031		ENTR		

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SUBSYSTEM LEM G & N SYSTEM		ASSY		
MANUAL LOAD PROCEDURES		CTS UPLINK TAPE LOAD PROCEDURES		
30. Set AGREEMENT A digitswitches on Logic Drawer No. 2 to XXXX4005. Set AGREEMENT A switch to SAMPLE.		30. When tape stops, set AGREEMENT A digitswitches on Logic Drawer No. 2 to XXXX4005. Set AGREEMENT A switch to SAMPLE.		
31. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.		31. Verify that RG display does not indicate 34055.		
32. Enter VERB 30 and press ENTR pushbutton on DSKY.		32. Press EXECUTE pushbutton on Programmer and Monitor panel.		
33. Observe that in approximately 10 seconds the PROG display on the DSKY indicates 11, Row 1 increments to 77777, causing RZ display on Programmer and Monitor panel to indicate 4006.		33. Observe that in approximately 10 seconds the PROG display on the DSKY indicates 11, Row 1 increments to 77777, causing RG display on Programmer and Monitor panel to indicate 34055.		
34. Perform following DSKY operations:		34. Press EXECUTE pushbutton on Programmer and Monitor panel.		
a. VERB 36		ENTR		
b. VERB 21	NOUN 01	ENTR		
c. 00031		ENTR		
d. 40000		ENTR		
e. VERB 11	NOUN 01	ENTR		
f. 00031		ENTR		
35. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.		35. When tape stops, set AGREEMENT A switch to OFF and then to SAMPLE. Verify that RG display does not indicate 34055.		
36. Enter VERB 30 and press ENTR pushbutton on DSKY.		36. Press EXECUTE pushbutton on Programmer and Monitor panel.		
37. Observe that in approximately 10 seconds the PROG display on the DSKY indicates 11 and Row 1 increments to 77777 causing RZ display on Programmer and Monitor panel to indicate 4006.		37. Observe that in approximately 10 seconds the PROG display on the DSKY indicates 11 and Row 1 increments to 77777 causing RG display on Programmer and Monitor panel to indicate 34055.		

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SUBSYSTEM LEM G & N SYSTEM		ASSY		
MANUAL LOAD PROCEDURES		CTS UPLINK TAPE LOAD PROCEDURES		
38. Enter VERB 36 and press ENTR pushbutton on DSKY.		38. Press EXECUTE pushbutton on Programmer and Monitor panel.		
39. Perform following DSKY operations:		RADAR RUPT TEST		
a. VERB 24	NOUN 01	ENTR		
b. 01303		ENTR		
c. 04353		ENTR		
d. 00010		ENTR		
e. VERB 22	NOUN 26	ENTR		
f. 01300		ENTR		
40. Set AGREEMENT A digitswitches on Logic Drawer No. 2 to XXXX4045. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.		40. When tape stops, set AGREEMENT A digitswitches on Logic Drawer No. 2 to XXXX4045. Set AGREEMENT A switch to OFF and then to SAMPLE. Verify that RG display does not indicate 34062.		
41. Enter VERB 30 and press ENTR pushbutton on DSKY.		41. Press EXECUTE pushbutton on Programmer and Monitor panel.		
42. Verify that RZ display on Programmer and Monitor panel indicates 4046 and PROG lamp on DSKY is lighted. Press RSET pushbutton. PROG lamp shall go out.		42. Verify that RG display indicates 34062 and PROG lamp on DSKY is lighted. Press RSET pushbutton. PROG lamp shall go out.		
43. Set AGREEMENT A digitswitches on Logic Drawer No. 2 to XXXX4050.		T10 RUPT TEST		
44. Perform following DSKY operations:		44. Press EXECUTE pushbutton on Programmer and Monitor panel.		
a. VERB 21	NOUN 01	ENTR		
b. 01304		ENTR		
c. 04000		ENTR		
d. VERB 30		ENTR		
45. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.		45. When tape stops, set AGREEMENT A switch to OFF and then to SAMPLE. Verify that RG display does not indicate 50017.		

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SUBSYSTEM	LEM G & N SYSTEM	ASSY		
	MANUAL LOAD PROCEDURES	CTS UPLINK TAPE LOAD PROCEDURES		
	46. Press to light CH31-1/IN2-1 push-button on RDC Interface panel. Verify that RZ display on Programmer and Monitor panel indicates 4051.	46. Press to light CH31-1/IN2-1 push-button on RDC Interface panel. Verify that RG display on Programmer and Monitor panel indicates 50017.		
	47. Press to extinguish CH31-1/IN2-1 pushbutton on RDC Interface panel.	47. Press to extinguish CH31-1/IN2-1 pushbutton on RDC Interface panel.		
	48. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.	48. Set AGREEMENT A switch to OFF and then to SAMPLE. Verify that RG display does not indicate 50017.		
	49. Enter VERB 30 and press ENTR pushbutton on DSKY.	49. Press EXECUTE pushbutton on Programmer and Monitor panel.		
	50. Press to light CH31-2/IN2-2 push-button on RDC Interface panel. Verify that RZ display on Programmer and Monitor panel indicates 4051.	50. Press to light CH31-2/IN2-2 push-button on RDC Interface panel. Verify that RG display on Programmer and Monitor panel indicates 50017.		
	51. Press to extinguish CH31-2/IN2-2 pushbutton on RDC Interface panel.	51. Press to extinguish CH31-2/IN2-2 pushbutton on RDC Interface panel.		
	52. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.	52. Set AGREEMENT A switch to OFF and then to SAMPLE. Verify that RG display does not indicate 50017.		
	53. Enter VERB 30 and press ENTR pushbutton on DSKY.	53. Press EXECUTE pushbutton on Programmer and Monitor panel.		
	54. Press to light CH31-3/IN2-3 push-button on RDC Interface panel. Verify that RZ display on Programmer and Monitor panel indicates 4051.	54. Press to light CH31-3/IN2-3 push-button on RDC Interface panel. Verify that RG display on Programmer and Monitor panel indicates 50017.		
	55. Press to extinguish CH31-3/IN2-3 pushbutton on RDC Interface panel.	55. Press to extinguish CH31-3/IN2-3 pushbutton on RDC Interface panel.		
	56. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.	56. Set AGREEMENT A switch to OFF and then to SAMPLE. Verify that RG display does not indicate 50017.		
	57. Enter VERB 30 and Press ENTR pushbutton on DSKY.	57. Press EXECUTE pushbutton on Programmer and Monitor panel.		

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SUBSYSTEM	LEM G & N SYSTEM	ASSY		
	MANUAL LOAD PROCEDURES	CTS UPLINK TAPE LOAD PROCEDURES		
58. Press to light CH31-4/IN2-4 push-button on RDC Interface panel. Verify that RZ display on Programmer and Monitor panel indicates 4051.		58. Press to light CH31-4/IN2-4 push-button on RDC Interface panel. Verify that RG display on Programmer and Monitor panel indicates 50017.		
59. Press to extinguish CH31-4/IN2-4 pushbutton on RDC Interface panel.		60. Set AGREEMENT A switch to OFF and then to SAMPLE. Verify that RG display does not indicate 50017.		
60. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.		61. Press EXECUTE pushbutton on Programmer and Monitor panel.		
61. Enter VERB 30 and press ENTR pushbutton on DSKY.		62. Press to light CH31-5/IN2-5 push-button on RDC Interface panel. Verify that RG display on Programmer and Monitor panel indicates 50017.		
62. Press to light CH31-5/IN2-5 push-button on RDC Interface panel. Verify that RZ display on Programmer and Monitor panel indicates 4051.		63. Press to extinguish CH31-5/IN2-5 pushbutton on RDC Interface panel.		
63. Press to extinguish CH31-5/IN2-5 pushbutton on RDC Interface panel.		64. Set AGREEMENT A switch to OFF and then to SAMPLE. Verify that RG display does not indicate 50017.		
64. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.		65. Press EXECUTE pushbutton on Programmer and Monitor panel.		
65. Enter VERB 30 and press ENTR pushbutton on DSKY.		66. Press to light CH31-6/IN2-6 push-button on RDC Interface panel. Verify that RG display on Programmer and Monitor panel indicates 4051.		
66. Press to light CH31-6/IN2-6 push-button on RDC Interface panel. Verify that RZ display on Programmer and Monitor panel indicates 4051.		67. Press to extinguish CH31-6/IN2-6 pushbutton on RDC Interface panel.		
67. Press to extinguish CH31-6/IN2-6 pushbutton on RDC Interface panel.		68. Set AGREEMENT A switch to OFF and then to SAMPLE. Verify that RG display does not indicate 50017.		
68. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.				

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SUBSYSTEM	LEM G & N SYSTEM	ASSY	
	MANUAL LOAD PROCEDURES	CTS UPLINK TAPE LOAD PROCEDURES	
69. Perform following DSKY operations:			
a. VERB 21 NOUN 01 ENTR			
b. 01304 ENTR			
c. 10000 ENTR			
d. VERB 30 ENTR			
70. Press to light CH31-7/IN2-7 pushbutton on RDC Interface panel. Verify that RZ display on Programmer and Monitor panel indicates 4051.			
71. Press to extinguish CH31-7/IN2-7 pushbutton on RDC Interface panel.			
72. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.			
73. Enter VERB 30 and press ENTR pushbutton on DSKY. Verify that RZ display on Programmer and Monitor panel indicates zero.			
74. Press to light CH31-8/IN2-8 pushbutton on RDC Interface panel. Verify that RZ display on Programmer and Monitor panel indicates 4051.			
75. Press to extinguish CH31-8/IN2-8 pushbutton on RDC Interface panel.			
76. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.			
77. Enter VERB 30 and press ENTR pushbutton on DSKY. Verify that RZ display on Programmer and Monitor panel indicates zero.			

69. Press EXECUTE pushbutton on Programmer and Monitor panel.	70. When tape stops, press to light CH31-7/IN2-7 pushbutton on RDC Interface panel. Verify that RG display on Programmer and Monitor panel indicates 50017.	72. Set AGREEMENT A switch to OFF and then to SAMPLE. Verify that RG display does not indicate 50017.	73. Press EXECUTE pushbutton on Programmer and Monitor panel. Verify that RG display does not indicate 50017.	74. Press to light CH31-8/IN2-8 pushbutton on RDC Interface panel. Verify that RG display on Programmer and Monitor panel indicates 50017.	76. Set AGREEMENT A switch to OFF and then to SAMPLE. Verify that RG display does not indicate 50017.	77. Press EXECUTE pushbutton on Programmer and Monitor panel. Verify that RG display does not indicate 50017.
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SUBSYSTEM	LEM G & N SYSTEM	ASSY		
	MANUAL LOAD PROCEDURES	CTS UPLINK TAPE LOAD PROCEDURES		
78. Press to light CH31-9/IN2-9 push-button on RDC Interface panel. Verify that RZ display on Programmer and Monitor panel indicates 4051.		78. Press to light CH31-9/IN2-9 push-button on RDC Interface panel. Verify that RZ display on Programmer and Monitor panel indicates 50017.		
79. Press to extinguish CH31-9/IN2-9 pushbutton on RDC Interface panel.		80. Set AGREEMENT A switch to OFF and then to SAMPLE. Verify that RG display does not indicate 50017.		
80. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.		81. Press EXECUTE pushbutton on Programmer and Monitor panel. Verify that RG display does not indicate 50017.		
81. Enter VERB 30 and press ENTR pushbutton on DSKY. Verify that RZ display on Programmer and Monitor panel indicates zero.		82. Press to light CH31-10/IN2-10 pushbutton on RDC Interface panel. Verify that RG display on Programmer and Monitor panel indicates 50017.		
82. Press to light CH31-10/IN2-10 pushbutton on RDC Interface panel. Verify that RZ display on Programmer and Monitor panel indicates 4051.		83. Press to extinguish CH31-10/IN2-10 pushbutton on RDC Interface panel.		
84. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.		84. Set AGREEMENT A switch to OFF and then to SAMPLE. Verify that RG display does not indicate 50017.		
85. Enter VERB 30 and press ENTR pushbutton on DSKY. Verify that RZ display on Programmer and Monitor panel indicates zero.		85. Press EXECUTE pushbutton on Programmer and Monitor panel. Verify that RG display does not indicate 50017.		
86. Press to light CH31-11/IN2-11 pushbutton on RDC Interface panel. Verify that RZ display on Programmer and Monitor panel indicates 4051.		86. Press to light CH31-11/IN2-11 pushbutton on RDC Interface panel. Verify that RG display on Programmer and Monitor panel indicates 50017.		
87. Press to extinguish CH31-11/IN2-11 pushbutton on RDC Interface panel.				

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MANUAL LOAD PROCEDURES				
CTS UPLINK TAPE LOAD PROCEDURES				
88. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.				
89. Enter VERB 30 and press ENTR pushbutton on DSKY. Verify that RZ display on Programmer and Monitor panel indicates zero.				
90. Press to light CH31-12/IN2-12 pushbutton on RDC Interface panel. Verify that RZ display on Programmer and Monitor panel indicates 4051.				
91. Press to extinguish CH31-12/IN2-12 pushbutton on RDC Interface panel.				
92. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.				
93. Perform the following DSKY operations:				
a. VERB 21 NOUN 01 ENTR				
b. 01304 ENTR				
c. 20000 ENTR				
d. VERB 11 NOUN 10 ENTR				
e. 00032 ENTR				
94. Press to light CH32-1/IN3-1 pushbutton on RDC Interface panel.				
95. Press to extinguish CH32-1/IN3-1 pushbutton on RDC Interface panel. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.				
96. Press to extinguish CH32-1/IN3-1 pushbutton on RDC Interface panel. Set AGREEMENT A switch on Logic Drawer No. 2 to OFF and then to SAMPLE. Verify that RZ display does not indicate 50017.				
94. When tape stops, press to light CH32-1/IN3-1 pushbutton on RDC Interface panel.				
95. Press to extinguish CH32-1/IN3-1 pushbutton on RDC Interface panel. Set AGREEMENT A switch on Logic Drawer No. 2 to OFF and then to SAMPLE. Verify that RZ display does not indicate 50017.				

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MANUAL LOAD PROCEDURES				
CTS UPLINK TAPE LOAD PROCEDURES				
96. Press to light CH32-1/IN3-1 pushbutton on RDC Interface panel. Verify that RZ display on Programmer and Monitor panel indicates zero.				
97. Enter VERB 30 and press ENTR pushbutton on DSKY. Verify that RZ display on Programmer and Monitor panel indicates 4051.				
98. Press to extinguish CH32-1/IN3-1 pushbutton on RDC Interface panel.				
99. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.				
100. Press to light CH32-2/IN3-2 pushbutton on RDC Interface panel. Verify that RZ display on Programmer and Monitor panel indicates zero.				
101. Enter VERB 30 and press ENTR pushbutton on DSKY. Verify that RZ display on Programmer and Monitor panel indicates 4051.				
102. Press to extinguish CH32-2/IN3-2 pushbutton on RDC Interface panel.				
103. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.				
104. Press to light CH32-3/IN3-3 pushbutton on RDC Interface panel. Verify that RZ display on Programmer and Monitor panel indicates zero.				
105. Enter VERB 30 and press ENTR pushbutton on DSKY. Verify that RZ display on Programmer and Monitor panel indicates 4051.				

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SUBSYSTEM	LEM G & N SYSTEM	ASSY		
MANUAL LOAD PROCEDURES				
CTS UPLINK TAPE LOAD PROCEDURES				
106. Press to extinguish CH32-3/IN3-3 pushbutton on RDC Interface panel.				
107. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.				
108. Press to light CH32-4/IN3-4 pushbutton on RDC Interface panel. Verify that RZ display on Programmer and Monitor panel indicates zero.				
109. Enter VERB 30 and press ENTR pushbutton on DSKY. Verify that RZ display on Programmer and Monitor panel indicates 4051.				
110. Press to extinguish CH32-4/IN3-4 pushbutton on RDC Interface panel.				
111. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.				
112. Press to light CH32-5/IN3-5 pushbutton on RDC Interface panel. Verify that RZ display on Programmer and Monitor panel indicates zero.				
113. Enter VERB 30 and press ENTR pushbutton on DSKY. Verify that RZ display on Programmer and Monitor panel indicates 4051.				
114. Press to extinguish CH32-5/IN3-5 pushbutton on RDC Interface panel.				
115. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.				

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JOB	G & N SYSTEM OPERATIONAL TEST	JDC 12617	REV 5	PAGE 20 OF 30
SUBSYSTEM	LEM G & N SYSTEM	ASSY		
MANUAL LOAD PROCEDURES				
CTS UPLINK TAPE LOAD PROCEDURES				
116. Press to light CH32-6/IN3-6 pushbutton on RDC Interface panel. Verify that RZ display on Programmer and Monitor panel does not indicate 50017.				
117. Press EXECUTE pushbutton on Programmer and Monitor panel. Verify that RZ display indicates 50017.				
118. Press to extinguish CH32-6/IN3-6 pushbutton on RDC Interface panel.				
119. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.				
120. Press to light CH32-7/IN3-7 pushbutton on RDC Interface panel. Verify that RZ display on Programmer and Monitor panel indicates zero.				
121. Enter VERB 30 and press ENTR pushbutton on DSKY. Verify that RZ display on Programmer and Monitor panel indicates 4051.				
122. Press to extinguish CH32-7/IN3-7 pushbutton on RDC Interface panel.				
123. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.				
124. Press to light CH32-8/IN3-8 pushbutton on RDC Interface panel. Verify that RZ display on Programmer and Monitor panel indicates zero.				
125. Enter VERB 30 and press ENTR pushbutton on DSKY. Verify that RZ display on Programmer and Monitor panel indicates 4051.				

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JOB G & N SYSTEM OPERATIONAL TEST		JDC 12617 REV 8	PAGE 21 OF 30
SUBSYSTEM	LEM G & N SYSTEM	ASSY	
MANUAL LOAD PROCEDURES			
126. Press to extinguish CH32-9/IN3-8 pushbutton on RDC Interface panel.			
127. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.			
128. Press to light CH32-9/IN3-9 pushbutton on RDC Interface panel. Verify that RZ display on Programmer and Monitor panel indicates zero.			
129. Enter VERB 30 and press ENTR pushbutton on DSKY. Verify that RZ display on Programmer and Monitor panel indicates 4051.			
130. Press to extinguish CH32-9/IN3-9 pushbutton on RDC Interface panel.			
131. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.			
132. Press to light CH32-10/IN3-10 pushbutton on RDC Interface panel. Verify that RZ display on Programmer and Monitor panel indicates zero.			
133. Enter VERB 30 and press ENTR pushbutton on DSKY. Verify that RZ display on Programmer and Monitor panel indicates 4051.			
134. Press to extinguish CH32-10/IN3-10 pushbutton on RDC Interface panel.			
135. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.			
136. Enter VERB 36 and press ENTR pushbutton on DSKY.			

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JOB G & N SYSTEM OPERATIONAL TEST		JDC 12617 REV 8	PAGE 22 OF 30
SUBSYSTEM	LEM G & N SYSTEM	ASSY	
MANUAL LOAD PROCEDURES			
137. Perform following DSKY operations: a. VERB 21 NOUN 27 ENTR b. Observe: VERB 21 NOUN 27 Flashing c. 77767			
Allow test to run 5 minutes. Record any failures indicated by VERB 06 NOUN 31 being displayed on DSKY. If no failure occurs, write "none" on data sheet.			
NOTE: Perform steps 138 through 141 during 5 minute wait of LGC Self Test.			
PIPA AND IRIG TEST (Nominal Voltage)			
138. Press ISS OPERATE pushbutton on Test Control panel.			
139. Insure that at least 90 seconds have elapsed since performing step 138 and that the PIPA loops have closed as indicated by a butterfly pattern on the PIPA monitor scope of the OIA.			
140. Connect the input bus to the Digital Voltmeter (DVM) by setting the CROSSBAR CONTROL on the Primary Signal Selector panel to 173.			
141. Adjust the G&N POWER ADJUST control on the Test Control panel until the DVM indicates an input bus voltage of 28.0 (±0.25) vdc. Record indication.			
142. Press ALARM RESET pushbutton on Programmer and Monitor panel. Verify that AGC ALARMS #6 lamp goes out.			

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JOB G & N SYSTEM OPERATIONAL TEST		JDC 12617 REV 8	PAGE 23 OF 30
SUBSYSTEM	LEM G & N SYSTEM	ASSY	
MANUAL LOAD PROCEDURES			
143. Perform following DSKY operations: a. VERB 57 ENTR b. Observe: VERB 21 NOUN 01 Flashing c. 00004 d. Observe: VERB 16 NOUN 20 Displayed e. VERB 34 ENTR			
144. In approximately 12 minutes, VERB 06 NOUN 66 will flash. Local gravity as measured by X, Y, and Z PIPA's will be displayed in Row 1 and Row 2. Record indications.			
145. Enter VERB 33 and press ENTR pushbutton on DSKY.			
146. When VERB 06 NOUN 66 flash, the horizontal component of earth rate on the X, Y, and Z IRIG's will be displayed in Row 2. Record indication.			
PIPA AND IRIG TEST (Low Voltage)			
147. Connect the input bus to the DVM by setting the CROSSBAR CONTROL on the Primary Signal Selector panel to 173.			
148. Adjust the G&N POWER ADJUST control on the Test Control panel until the DVM indicates an input bus voltage of 24.5 (+0.25, -0) vdc. Record indication.			
149. Enter VERB 36 and press ENTR pushbutton on DSKY.			
150. Perform following DSKY operations: a. VERB 21 NOUN 27 ENTR b. Observe: VERB 21 NOUN 27 Flashing c. 77767			

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JOB G & N SYSTEM OPERATIONAL TEST		JDC 12617 REV 8	PAGE 24 OF 30
SUBSYSTEM	LEM G & N SYSTEM	ASSY	
MANUAL LOAD PROCEDURES			
Allow test to run 5 minutes. Record any failures indicated by VERB 06 NOUN 31 being displayed on DSKY. If no failure occurs, write "none" on data sheet.			
151. Perform following DSKY operations: a. VERB 57 ENTR b. Observe: VERB 21 NOUN 01 Flashing c. 00004 d. Observe: VERB 16 NOUN 20 Displayed e. VERB 34 ENTR			
152. In approximately 12 minutes, VERB 06 NOUN 66 will flash. Local gravity as measured by X, Y, and Z PIPA's will be displayed in Row 1 and Row 2. Record indications.			
153. Enter VERB 33 and press ENTR pushbutton on DSKY.			
154. When VERB 06 NOUN 66 flash, the horizontal component of earth rate on the X, Y, and Z IRIG's will be displayed in Row 2. Record indication.			
PIPA AND IRIG TEST (High Voltage)			
155. Connect the input bus to the DVM by setting the CROSSBAR CONTROL on the Primary Signal Selector panel to 173.			
156. Adjust the G&N POWER ADJUST control on the Test Control panel until the DVM indicates an input bus voltage of 33.5 (+0, -0.25) vdc. Record indication.			

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SUBSYSTEM LEM G &amp; N SYSTEM ASSY CTS UPLINK TAPE LOAD PROCEDURES

## MANUAL LOAD PROCEDURES

179. Perform the following DSKY operations:

- a. VERB 25 NOUN 01 ENTR  
b. 01300 ENTR  
c. 00004 ENTR  
d. 30067 ENTR  
e. 01300 ENTR  
f. VERB 25 NOUN 26 ENTR  
g. 00001 ENTR  
h. 01300 ENTR  
i. 00000 ENTR  
j. VERB 31 ENTR  
k. Observe that the RESTART lamp on DSKY lights

- l. VERB 01 NOUN 10 ENTR  
m. 00077 ENTR  
n. The contents of Row 1 on the DSKY shall be 00010 or 00110.

180. Reset contents of Restart Monitor to zero by performing DSKY entries as follows:

- a. VERB 21 NOUN 10 ENTR  
b. 00077 ENTR  
c. 00000 ENTR  
d. Press RSET pushbutton.

181. Perform the following DSKY operations:

- a. VERB 21 NOUN 01 ENTR  
b. 01300 ENTR  
c. 30000 ENTR  
d. NOUN 15 ENTR  
e. 01300 ENTR  
f. VERB 25 NOUN 26 ENTR  
g. 02000 ENTR  
h. 01300 ENTR  
i. 00000 ENTR  
j. VERB 30 ENTR

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FORM 00145  
Chg. 7-23-65APOLLO G&N  
EQUIPMENT TEST  
DATA SHEET 1 OF 2

JOB G &amp; N SYSTEM OPERATIONAL TEST

ASSEMBLY UNDER TEST		TEST HISTORY	
TITLE	DATE	START	END
SER. NO.	DWG	REV.	SITE / LOCATION
NAME		SER. NO.	CAL DATE
NAME		SER. NO.	CAL DATE
CONDUCTED BY			
APPROVED BY			

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ ACC
1 thru Displays	All DSKY character and condition lamps performed as required					
135	LGC self check failures					
137	IMU 28 vdc Bus	vdc	27.75		28.25	
141	gravity	cm/sec <sup>2</sup>	975.0		985.9	
144	Horizontal earth rate (R2)	ERU	See Table 1		See Table 1	
146	IMU 28 vdc Bus	vdc	24.50		24.75	
148	LGC self check failures					
150	gravity	cm/sec <sup>2</sup>	975.0		985.9	
152	Horizontal earth rate (R2)	ERU	See Table 1		See Table 1	

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FORM 01-6  
Chg. 7-13-65

SUBSYSTEM LEM G &amp; N SYSTEM ASSY CTS UPLINK TAPE LOAD PROCEDURES

## MANUAL LOAD PROCEDURES

k. Observe that the RESTART lamp on the DSKY lights in approximately 2 seconds.

- l. VERB 01 NOUN 10 ENTR  
m. 00077 ENTR  
n. The contents of Row 1 on the DSKY shall be 00020 or 00120.

182. Reset contents of Restart Monitor to zero by performing DSKY entries as follows:

- a. VERB 21 NOUN 10 ENTR  
b. 00077 ENTR  
c. 00000 ENTR  
d. Press RSET pushbutton.

183. Record compliance of DSKY displays for steps 175, 177, 179, and 181.

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FORM 00145  
Chg. 7-23-65APOLLO G&N  
EQUIPMENT TEST  
DATA SHEET 2 OF 2

JOB G &amp; N SYSTEM OPERATIONAL TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ ACC
156	IMU 28 vdc Bus	vdc	33.25		33.50	
158	LGC self check failures					
160	gravity	cm/sec <sup>2</sup>	975.0		985.9	
162	Horizontal earth rate (R2)	ERU	See Table 1		See Table 1	
183	Displays			All characters and lamps performed as required.		

Horizontal Earth Rate Tolerances		
Location	Min Value	Max Value
MIT	00000.64000	00000.84000
AC	00000.64000	00000.84000
MSC	00000.76000	00000.91000
NAA	00000.70000	00000.90000
MILA	00000.79000	00000.91000
GAEC	00000.65750	00000.85750

Table 1

COMMENTS:

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SUBSYSTEM LEM G & N SYSTEM  
DESCRIPTION The purpose of this test is to check gross G & N system operations. Computer-DSKY interface is checked by performing a computer controlled DSKY test which verifies correct DSKY character displays. A manual DSKY keyboard test is performed to verify correct key-character display operation. An alarm and interrupts test checks computer

Rev.	Date	TORR NO.	PAGES REVISED	APPROVAL	REFERENCES
A	5-25-66	29177	2-5	MJ NASA	JDC PS 6015000
B	7-21-66	30272	3-4	MM ACMA	
C	8-4-66	30519	2, 5	EA MB	IMPORTANT See below.
D	10-20-66	31617	1	EA	INTERVAL
E	7-27-67	32885	1, 5	EA	
F	7-27-67	34232	1	EA	
G	8-31-67	34457	3, 4, 5	EA	
H	11-30-67	35185	1, 3, 5	EA	TOOLS AND MATERIAL See appropriate section of JDC
I	1-11-68	35356	3	EA	
J	4-9-68	36044	ALL	EA	
K	7-25-68	36585	2, 3	EA	
L	10-24-68	36957	ALL	EA	
M	2-24-69	37364	19	EA	
N	3-27-69	37451	4, 10	EA	
O	5-26-70	38139	1, 27, 28, 29, 30	EA	
P	9-4-70	38203	30	JS	
Q	5-10-71	38414	27, 30, 31	EA	

DESCRIPTION (cont)

program error sensing capabilities. Finally a computer controlled test of PIPA and IRIG operation is performed with OG, IG, and MG at 45 degrees. In this position each PIPA IA is sensing some portion of positive g and the accumulative PIPA measurement should be checked by measuring the effect of the horizontal component of earth rate (cos x) in the same orientation. The IRIG and PIPA test is performed at normal, low, and high prime power levels with the LGC self check being performed concurrently.

IMPORTANT: 1. Obtain the time of day of high order scaler overflow from JDC 12614. To prevent erroneous test results, do not enter a PIPA and IRIG test within 0.2 hour of that time.

VERIFICATION WITH SIDL REQUIRED BEFORE USE

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2. Insure that connector assembly (2003099) or Restart Monitor module (2898989) is removed and W226-P1 is connected to the LGC test connector before proceeding with this JDC.
3. If the VERB display on the DSKY contains a number from 11 to 17, the KEY REL indicator may flash when DSKY entries are made.

INITIALIZATION

1. Perform JDC 12613 to establish a Master Initialization condition. Insure that the system is in ISS STANDBY with the computer operating and the CGC/LGC POWER ON and 400 CPS POWER ON pushbuttons on the Test Control

SUBSYSTEM LEM G & N SYSTEM  
panel lighted.

DSKY CHECK

2. Perform following DSKY operations:
  - VERB 36 ENTR
  - VERB 21 NOUN 27 ENTR
  - 00011 ENTR
3. Observe that all 9's are displayed in the PROG, VERB, NOUN, and Row 1, Row 2, and Row 3 character positions. Check that all applicable electroluminescent elements are lighted. Including the 9's, the following shall be displayed for approximately 5 seconds:

- 9's
  - 8's
  - 7's
  - 6's
  - 5's
  - 4's
  - 3's
  - 2's
  - 1's
  - 0's
  - Minus signs in Row 1, Row 2, and Row 3
  - VERB-NOUN Flashing approx. 5 seconds
  - COMP ACTY
  - Plus signs in Row 1, Row 2, and Row 3
  - VERB-NOUN Flashing approx. 5 seconds
  - COMP ACTY
- ALARMS #1 - RUPT LOC  
ALARMS #2 - CTR FAIL  
ALARMS #3 - TC TRAP  
ALARMS #4 - OSCILLATOR FAIL  
ALARMS #5 - NIGHTWATCH-MAN  
ALARMS #6 - PIPA FAIL  
ALARMS #7 - VOLTAGE FAIL  
ALARMS #8 - SCALER FAIL  
ALARMS #9 - WARNING FILTER  
ALARMS #12 - DOUBLE SCALER  
ALARMS #15 - GOJAM CTS P/N  
ALARMS #18 - E-MEM- 2014042-071 only  
PARITY FAIL

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SUBSYSTEM LEM G & N SYSTEM

q. COMP ACTY on for approx. 5 seconds then DSKY blanks

4. Enter VERB 35 and press ENTR pushbutton on DSKY. The following DSKY displays shall illuminate for approximately 5 seconds:

- UPLINK ACTY
- NO ATT
- STBY
- KEY REL Flashing
- TEMP
- GIMBAL LOCK
- PROG
- RESTART
- TRACKER
- OPR ERR Flashing
- VERB-NOUN Flashing
- Plus 88888 in Row 1, Row 2, and Row 3

After indications a through k go out, plus 88888's shall remain on Row 1, Row 2, and Row 3 and in VERB-NOUN displays.

MANUAL DSKY OPERATION CHECK

5. Perform following DSKY operations:
  - VERB 24 NOUN 01 ENTR
  - Observe:
    - VERB 24 NOUN 01 Flashing ENTR
    - 01700
    - Observe:
      - VERB 21 NOUN 01 Flashing ENTR
      - +12345

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SUBSYSTEM LEM G & N SYSTEM

MANUAL LOAD PROCEDURES

TOOLS AND MATERIAL:

None

CTS UPLINK TAPE LOAD PROCEDURES

JDC 12617 CTS UPLINK

Tape, P/N 2901655-002

NOTE: Prepare the LGC for the UPLINK code by establishing the following conditions on the CTS:

- XY Interface panel - Press to light POSITIVE, NEGATIVE, and TAPE READER pushbuttons. Set AGC INPUT COUNTERS switch to 9.
- Programmer and Monitor panel - Press to light AGC INPUT-CTR and TAPE FREE RUN pushbuttons. Logic Drawer No. 2 - Set AGREEMENT B digit switches to X12X3672. Set AGREEMENT B switch to STOP.
- RDC Interface panel - Press to light CH33-10 pushbutton.
- Tape Reader - Set Power switch to ON. Load the CTS UPLINK tape. If alarms occur, press PROCEED and ALARM RESET pushbuttons on Programmer

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JOB	G & N SYSTEM OPERATIONAL TEST	JDC 12617	REV	T	PAGE 13 OF 31
SUBSYSTEM	LEM G & N SYSTEM	ASSY			
MANUAL LOAD PROCEDURES					
46. Press to light CH31-1/ IN2-1 push-button on RDC Interface panel. Verify that RZ display on Programmer and Monitor panel indicates 4051.					
47. Press to extinguish CH31-1/ IN2-1 pushbutton on RDC Interface panel.					
48. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.					
49. Enter VERB 30 and press ENTR pushbutton on DSKY.					
50. Press to light CH31-2/ IN2-2 push-button on RDC Interface panel. Verify that RZ display on Programmer and Monitor panel indicates 4051.					
51. Press to extinguish CH31-2/ IN2-2 pushbutton on RDC Interface panel.					
52. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.					
53. Enter VERB 30 and press ENTR pushbutton on DSKY.					
54. Press to light CH31-3/ IN2-3 push-button on RDC Interface panel. Verify that RZ display on Programmer and Monitor panel indicates 4051.					
55. Press to extinguish CH31-3/ IN2-3 pushbutton on RDC Interface panel.					
56. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.					
57. Enter VERB 30 and Press ENTR pushbutton on DSKY.					

CTS UPLINK TAPE LOAD PROCEDURES	
46. Press to light CH31-1/ IN2-1 push-button on RDC Interface panel. Verify that RG display on Programmer and Monitor panel indicates 50017.	
47. Press to extinguish CH31-1/ IN2-1 pushbutton on RDC Interface panel.	
48. Set AGREEMENT A switch to OFF and then to SAMPLE. Verify that RG display does not indicate 50017.	
49. Press EXECUTE pushbutton on Programmer and Monitor panel.	
50. Press to light CH31-2/ IN2-2 push-button on RDC Interface panel. Verify that RG display on Programmer and Monitor panel indicates 50017.	
51. Press to extinguish CH31-2/ IN2-2 pushbutton on RDC Interface panel.	
52. Set AGREEMENT A switch to OFF and then to SAMPLE. Verify that RG display does not indicate 50017.	
53. Press EXECUTE pushbutton on Programmer and Monitor panel.	
54. Press to light CH31-3/ IN2-3 push-button on RDC Interface panel. Verify that RG display on Programmer and Monitor panel indicates 50017.	
55. Press to extinguish CH31-3/ IN2-3 pushbutton on RDC Interface panel.	
56. Set AGREEMENT A switch to OFF and then to SAMPLE. Verify that RG display does not indicate 50017.	
57. Press EXECUTE pushbutton on Programmer and Monitor panel.	

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JOB	G & N SYSTEM OPERATIONAL TEST	JDC 12617	REV	T	PAGE 14 OF 31
SUBSYSTEM	LEM G & N SYSTEM	ASSY			
MANUAL LOAD PROCEDURES					
58. Press to light CH31-4/ IN2-4 push-button on RDC Interface panel. Verify that RZ display on Programmer and Monitor panel indicates 4051.					
59. Press to extinguish CH31-4/ IN2-4 pushbutton on RDC Interface panel.					
60. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.					
61. Enter VERB 30 and press ENTR pushbutton on DSKY.					
62. Press to light CH31-5/ IN2-5 push-button on RDC Interface panel. Verify that RZ display on Programmer and Monitor panel indicates 4051.					
63. Press to extinguish CH31-5/ IN2-5 pushbutton on RDC Interface panel.					
64. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.					
65. Enter VERB 30 and press ENTR pushbutton on DSKY.					
66. Press to light CH31-6/ IN2-6 push-button on RDC Interface panel. Verify that RZ display on Programmer and Monitor panel indicates 4051.					
67. Press to extinguish CH31-6/ IN2-6 pushbutton on RDC Interface panel.					
68. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.					

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JOB	G & N SYSTEM OPERATIONAL TEST	JDC 12617	REV T	PAGE 15 OF 31
SUBSYSTEM	LEM G & N SYSTEM	ASSY		
MANUAL LOAD PROCEDURES				
69. Perform following DSKY operations:				
a. VERB 21	NOUN 01	ENTR		
b. 01304		ENTR		
c. 10000		ENTR		
d. VERB 30		ENTR		
70. Press to light CH31-7/ IN2-7 pushbutton on RDC Interface panel. Verify that RZ display on Programmer and Monitor panel indicates 4051.				
71. Press to extinguish CH31-7/ IN2-7 pushbutton on RDC Interface panel.				
72. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.				
73. Enter VERB 30 and press ENTR pushbutton on DSKY. Verify that RZ display on Programmer and Monitor panel indicates zero.				
74. Press to light CH31-8/ IN2-8 pushbutton on RDC Interface panel. Verify that RZ display on Programmer and Monitor panel indicates 4051.				
75. Press to extinguish CH31-8/ IN2-8 pushbutton on RDC Interface panel.				
76. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.				
77. Enter VERB 30 and press ENTR pushbutton on DSKY. Verify that RZ display on Programmer and Monitor panel indicates zero.				

CTS UPLINK TAPE LOAD PROCEDURES	
69. Press EXECUTE pushbutton on Programmer and Monitor panel.	
70. When tape stops, press to light CH31-7/ IN2-7 pushbutton on RDC Interface panel. Verify that RG display on Programmer and Monitor panel indicates 50017.	
72. Set AGREEMENT A switch to OFF and then to SAMPLE. Verify that RG display does not indicate 50017.	
73. Press EXECUTE pushbutton on Programmer and Monitor panel. Verify that RG display does not indicate 50017.	
74. Press to light CH31-8/ IN2-8 pushbutton on RDC Interface panel. Verify that RG display on Programmer and Monitor panel indicates 50017.	
76. Set AGREEMENT A switch to OFF and then to SAMPLE. Verify that RG display does not indicate 50017.	
77. Press EXECUTE pushbutton on Programmer and Monitor panel. Verify that RG display does not indicate 50017.	

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JOB	G & N SYSTEM OPERATIONAL TEST	JDC 12617	REV T	PAGE 16 OF 31
SUBSYSTEM	LEM G & N SYSTEM	ASSY		
<u>MANUAL LOAD PROCEDURES</u>		CTS UPLINK TAPE LOAD PROCEDURES		
78. Press to light CH31-9/ IN2-9 push-button on RDC Interface panel. Verify that RZ display on Programmer and Monitor panel indicates 4051.		78. Press to light CH31-9/ IN2-9 push-button on RDC Interface panel. Verify that RG display on Programmer and Monitor panel indicates 50017.		
79. Press to extinguish CH31-9/ IN2-9 pushbutton on RDC Interface panel.		80. Set AGREEMENT A switch to OFF and then to SAMPLE. Verify that RG display does not indicate 50017.		
80. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.		81. Press EXECUTE pushbutton on Programmer and Monitor panel. Verify that RG display does not indicate 50017.		
81. Enter VERB 30 and press ENTR pushbutton on DSKY. Verify that RZ display on Programmer and Monitor panel indicates zero.		82. Press to light CH31-10/ IN2-10 push-button on RDC Interface panel. Verify that RG display on Programmer and Monitor panel indicates 50017.		
82. Press to light CH31-10/ IN2-10 push-button on RDC Interface panel. Verify that RZ display on Programmer and Monitor panel indicates 4051.		83. Press to extinguish CH31-10/ IN2-10 pushbutton on RDC Interface panel.		
83. Press to extinguish CH31-10/ IN2-10 pushbutton on RDC Interface panel.		84. Set AGREEMENT A switch to OFF and then to SAMPLE. Verify that RG display does not indicate 50017.		
84. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.		85. Press EXECUTE pushbutton on Programmer and Monitor panel. Verify that RG display does not indicate 50017.		
85. Enter VERB 30 and press ENTR pushbutton on DSKY. Verify that RZ display on Programmer and Monitor panel indicates zero.		86. Press to light CH31-11/ IN2-11 pushbutton on RDC Interface panel. Verify that RG display on Programmer and Monitor panel indicates 50017.		
86. Press to light CH31-11/ IN2-11 push-button on RDC Interface panel. Verify that RZ display on Programmer and Monitor panel indicates 4051.		87. Press to extinguish CH31-11/ IN2-11 pushbutton on RDC Interface panel.		
87. Press to extinguish CH31-11/ IN2-11 pushbutton on RDC Interface panel.				

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JOB G & N SYSTEM OPERATIONAL TEST		JDC 12617 REV T	PAGE 21 OF 31
SUBSYSTEM	LEM G & N SYSTEM	ASSY	
MANUAL LOAD PROCEDURES		CTS UPLINK TAPE LOAD PROCEDURES	
126. Press to extinguish CH32-9/IN3-8 pushbutton on RDC Interface panel.			
127. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.		127. Set AGREEMENT A switch to OFF and then to SAMPLE. Verify that RG display does not indicate 50017.	
128. Press to light CH32-9/IN3-9 pushbutton on RDC Interface panel. Verify that RZ display on Programmer and Monitor panel indicates zero.		128. Press to light CH32-9/IN3-9 pushbutton on RDC Interface panel. Verify that RG display on Programmer and Monitor panel does not indicate 50017.	
129. Enter VERB 30 and press ENTR pushbutton on DSKY. Verify that RZ display on Programmer and Monitor panel indicates 4051.		129. Press EXECUTE pushbutton on Programmer and Monitor panel. Verify that RG display indicates 50017.	
130. Press to extinguish CH32-9/IN3-9 pushbutton on RDC Interface panel.		130. Press to extinguish CH32-9/IN3-9 pushbutton on RDC Interface panel.	
131. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.		131. Set AGREEMENT A switch to OFF and then to SAMPLE. Verify that RG display does not indicate 50017.	
132. Press to light CH32-10/IN3-10 pushbutton on RDC Interface panel. Verify that RZ display on Programmer and Monitor panel indicates zero.		132. Press to light CH32-10/IN3-10 pushbutton on RDC Interface panel. Verify that RG display on Programmer and Monitor panel does not indicate 50017.	
133. Enter VERB 30 and press ENTR pushbutton on DSKY. Verify that RZ display on Programmer and Monitor panel indicates 4051.		133. Press EXECUTE pushbutton on Programmer and Monitor panel. Verify that RG display indicates 50017.	
134. Press to extinguish CH32-10/IN3-10 pushbutton on RDC Interface panel.		134. Press to extinguish CH32-10/IN3-10 pushbutton on RDC Interface panel.	
135. Press CL pushbutton on keyboard of Programmer and Monitor panel. Verify that RZ display clears.		135. Set AGREEMENT A switch to OFF and then to SAMPLE. Verify that RG display does not indicate 50017.	
136. Enter VERB 36 and press ENTR pushbutton on DSKY.		136. Press EXECUTE pushbutton on Programmer and Monitor panel.	

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JOB G & N SYSTEM OPERATIONAL TEST		JDC 12617 REV T	PAGE 22 OF 31
SUBSYSTEM	LEM G & N SYSTEM	ASSY	
MANUAL LOAD PROCEDURES		CTS UPLINK TAPE LOAD PROCEDURES	
137. Perform following DSKY operations: a. VERB 21 NOUN 27 ENTR b. Observe: VERB 21 NOUN 27 Flashing c. 77767		137. Set AGREEMENT B switch on Logic Drawer No. 2 to SAMPLE. Press EXECUTE pushbutton on Programmer and Monitor panel. 137A. When VERB 21 NOUN 27 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel. Allow test to run 5 minutes. Record any failures indicated by VERB 05 NOUN 31 being displayed on DSKY. If no failure occurs, write "none" on data sheet. NOTE: Perform steps 138 through 141 during 5 minute wait of LGC Self Test. PIPA AND IRIG TEST (Nominal Voltage)	
138. Press ISS OPERATE pushbutton on Test Control panel.		138. Press ISS OPERATE pushbutton on Test Control panel.	
139. Insure that at least 90 seconds have elapsed since performing step 138 and that the PIPA loops have closed as indicated by a butterfly pattern on the PIPA monitor scope of the OIA.		139. Insure that at least 90 seconds have elapsed since performing step 138 and that the PIPA loops have closed as indicated by a butterfly pattern on the PIPA monitor scope of the OIA.	
140. Connect the input bus to the Digital Voltmeter (DVM) by setting the CROSSBAR CONTROL on the Primary Signal Selector panel to 173.		140. Connect the input bus to the Digital Voltmeter (DVM) by setting the CROSSBAR CONTROL on the Primary Signal Selector panel to 173.	
141. Adjust the G&N POWER ADJUST control on the Test Control panel until the DVM indicates an input bus voltage of 28.0 (±0.25) vdc. Record indication.		141. Adjust the G&N POWER ADJUST control on the Test Control panel until the DVM indicates an input bus voltage of 28.0 (±0.25) vdc. Record indication.	
142. Press ALARM RESET pushbutton on Programmer and Monitor panel. Verify that AGC ALARMS #6 lamp goes out.		142. Press ALARM RESET pushbutton on Programmer and Monitor panel. Verify that AGC ALARMS #6 lamp goes out.	

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JOB G & N SYSTEM OPERATIONAL TEST		JDC 12617 REV T	PAGE 23 OF 31
SUBSYSTEM	LEM G & N SYSTEM	ASSY	
MANUAL LOAD PROCEDURES		CTS UPLINK TAPE LOAD PROCEDURES	
143. Perform following DSKY operations: a. VERB 57 ENTR b. Observe: VERB 21 NOUN 01 Flashing c. 00004 d. Observe: VERB 16 NOUN 20 Displayed e. VERB 34 ENTR		143. Press EXECUTE pushbutton on Programmer and Monitor panel. 143A. When VERB 21 NOUN 01 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel. 143B. When VERB 16 NOUN 20 are displayed on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel. 144. In approximately 12 minutes, VERB 06 NOUN 66 will flash. Local gravity as measured by X, Y, and Z PIPA's will be displayed in Row 1 and Row 2. Record indications.	
145. Enter VERB 33 and press ENTR pushbutton on DSKY.		145. Press EXECUTE pushbutton on Programmer and Monitor panel.	
146. When VERB 06 NOUN 66 flash, the horizontal component of earth rate on the X, Y, and Z IRIG's will be displayed in Row 2. Record indication.		146. When VERB 06 NOUN 66 flash, the horizontal component of earth rate on the X, Y, and Z IRIG's will be displayed in Row 2. Record indication.	
147. Connect the input bus to the DVM by setting the CROSSBAR CONTROL on the Primary Signal Selector panel to 173.		147. Connect the input bus to the DVM by setting the CROSSBAR CONTROL on the Primary Signal Selector panel to 173.	
148. Adjust the G&N POWER ADJUST control on the Test Control panel until the DVM indicates an input bus voltage of 24.5 (±0.25, -0) vdc. Record indication.		148. Adjust the G&N POWER ADJUST control on the Test Control panel until the DVM indicates an input bus voltage of 24.5 (±0.25, -0) vdc. Record indication.	
149. Enter VERB 36 and press ENTR pushbutton on DSKY.		149. Press EXECUTE pushbutton on Programmer and Monitor panel.	
150. Perform following DSKY operations: a. VERB 21 NOUN 27 ENTR b. Observe: VERB 21 NOUN 27 Flashing c. 77767		150. Press EXECUTE pushbutton on Programmer and Monitor panel. 150A. When VERB 21 NOUN 27 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.	

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JOB G & N SYSTEM OPERATIONAL TEST		JDC 12617 REV T	PAGE 24 OF 31
SUBSYSTEM	LEM G & N SYSTEM	ASSY	
MANUAL LOAD PROCEDURES		CTS UPLINK TAPE LOAD PROCEDURES	
151. Perform following DSKY operations: a. VERB 57 ENTR b. Observe: VERB 21 NOUN 01 Flashing c. 00004 d. Observe: VERB 16 NOUN 20 Displayed e. VERB 34 ENTR		151. Press EXECUTE pushbutton on Programmer and Monitor panel. 151A. When VERB 21 NOUN 01 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel. 151B. When VERB 16 NOUN 20 are displayed on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel. 152. In approximately 12 minutes, VERB 06 NOUN 66 will flash. Local gravity as measured by X, Y, and Z PIPA's will be displayed in Row 1 and Row 2. Record indications.	
153. Enter VERB 33 and press ENTR pushbutton on DSKY.		153. Press EXECUTE pushbutton on Programmer and Monitor panel.	
154. When VERB 06 NOUN 66 flash, the horizontal component of earth rate on the X, Y, and Z IRIG's will be displayed in Row 2. Record indication.		154. When VERB 06 NOUN 66 flash, the horizontal component of earth rate on the X, Y, and Z IRIG's will be displayed in Row 2. Record indication.	
155. Connect the input bus to the DVM by setting the CROSSBAR CONTROL on the Primary Signal Selector panel to 173.		155. Connect the input bus to the DVM by setting the CROSSBAR CONTROL on the Primary Signal Selector panel to 173.	
156. Adjust the G&N POWER ADJUST control on the Test Control panel until the DVM indicates an input bus voltage of 33.5 (±0, -0.25) vdc. Record indication.		156. Adjust the G&N POWER ADJUST control on the Test Control panel until the DVM indicates an input bus voltage of 33.5 (±0, -0.25) vdc. Record indication.	

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JOB	G & N SYSTEM OPERATIONAL TEST	JDC 12617	REV T	PAGE 25 OF 31
SUBSYSTEM	LEM G & N SYSTEM	ASSY		
MANUAL LOAD PROCEDURES		CTS UPLINK TAPE LOAD PROCEDURES		
157. Enter VERB 36 and press ENTR pushbutton on DSKY.		157. Press EXECUTE pushbutton on Programmer and Monitor panel.		
158. Perform following DSKY operations:		158. Press EXECUTE pushbutton on Programmer and Monitor panel.		
a.	VERB 21 NOUN 27 ENTR	159A. When VERB 21 NOUN 27 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.		
b.	Observe: VERB 21 NOUN 27 Flashing			
c.	77767 ENTR			
Allow test to run 5 minutes. Record any failures indicated by VERB 05 NOUN 31 being displayed on DSKY. If no failure occurs, write "none" on data sheet.		Allow test to run 5 minutes. Record any failures indicated by VERB 05 NOUN 31 being displayed on DSKY. If no failure occurs, write "none" on data sheet.		
159. Perform following DSKY operations:		159. Press EXECUTE pushbutton on Programmer and Monitor panel.		
a.	VERB 57 ENTR	159A. When VERB 21 NOUN 01 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.		
b.	Observe: VERB 21 NOUN 01 Flashing			
c.	00004 ENTR			
d.	Observe: VERB 16 NOUN 20 Displayed	159B. When VERB 16 NOUN 20 are displayed on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.		
e.	VERB 34 ENTR			
160. In approximately 12 minutes, VERB 06 NOUN 66 will flash. Local gravity as measured by X, Y, and Z PIPA's will be displayed in Row 1 and Row 2. Record indications.		160. In approximately 12 minutes, VERB 06 NOUN 66 will flash. Local gravity as measured by X, Y, and Z PIPA's will be displayed in Row 1 and Row 2. Record indications.		
161. Enter VERB 33 and press ENTR pushbutton on DSKY.		161. Press EXECUTE pushbutton on Programmer and Monitor panel.		
162. When VERB 06 NOUN 66 flash, the horizontal component of earth rate on the X, Y, and Z IRIG's will be displayed in Row 2. Record indication.		162. When VERB 06 NOUN 66 flash, the horizontal component of earth rate on the X, Y, and Z IRIG's will be displayed in Row 2. Record indication.		
163. Enter VERB 36 and press ENTR pushbutton on DSKY.		163. Press EXECUTE pushbutton on Programmer and Monitor panel.		

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JOB G & N SYSTEM OPERATIONAL TEST		JDC 12617	REV T	PAGE 26 OF 31
SUBSYSTEM	LEM G & N SYSTEM	ASSY		
MANUAL LOAD PROCEDURES		CTS UPLINK TAPE LOAD PROCEDURES		
164. Connect the input bus to the DVM by setting the CROSSBAR CONTROL on the Primary Signal Selector panel to 173.				
165. Adjust the G&N POWER ADJUST control on the Test Control panel until the DVM indicates an input bus voltage of 28.0 (±0.25) vdc.				
		166. Press to extinguish POSITIVE, NEGATIVE, and TAPE READER pushbutton on XY Interface panel. Set AGC INPUT COUNTERS switch to 1.		
		167. Press MONITOR pushbutton on Programmer and Monitor panel. MONITOR pushbutton shall light. AGC INPUT-CTR pushbutton shall go out. Press to extinguish TAPE FREE RUN pushbutton.		
		168. Set AGREEMENT A and B switches on Logic Drawer No. 2 to OFF and then set AGREEMENT A and B digit switches to XXXXXXXX.		
		169. Press to extinguish CH33-10 pushbutton on RDC Interface panel.		
		170. Set Power switch on Tape Reader to OFF and remove tape. If alarms occur, press ALARM RESET pushbutton on Programmer and Monitor panel and press RSET pushbutton on DSKY.		

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JOB	G & N SYSTEM OPERATIONAL TEST	JDC 12617	REV T	PAGE 27 OF 31
SUBSYSTEM	LEM G & N SYSTEM	ASSY		
MANUAL LOAD PROCEDURES		CTS UPLINK TAPE LOAD PROCEDURES		
NOTE: The procedures of step 171 through step 183 and step 186 apply only when Restart Monitor module (2898989) is installed.				
171. Downmode the system to OIA On mode according to procedure given in JDC 12614.				
172. Remove W226-P1 from LGC test connector.				
CAUTION: Observe marking on Restart Monitor module and insure proper keying when installing.				
173. Install Restart Monitor module on LGC test connector as follows:				
a. Carefully locate module on guide pins of LGC test connector maintaining parallelism between module and test connector as closely as possible and engage the four corner jackscrews until finger tight.				
b. To fully engage module to computer, turn each jackscrew one quarter turn at a time moving around the module in sequence. When fully engaged, torque each jackscrew to 19 ± 1 in-lb.				
174. Advance system to ISS STANDBY mode according to the procedure given in JDC 12614.				
175. Perform the following DSKY operations:				
a.	VERB 27	NOUN 01	ENTR	
b.	07700		ENTR	
c. Observe that RESTART lamp on the DSKY lights.				
d.	VERB 01	NOUN 10	ENTR	
e.	00077		ENTR	
f. The contents of Row 1 on the DSKY shall be 00001 or 00101.				

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JOB	G & N SYSTEM OPERATIONAL TEST	JDC 12617	REV T	PAGE 28 OF 31
SUBSYSTEM	LEM G & N SYSTEM	ASSY		
MANUAL LOAD PROCEDURES		CTS UPLINK TAPE LOAD PROCEDURES		
176. Reset contents of Restart Monitor to zero by performing DSKY entries as follows:				
a.	VERB 21	NOUN 10	ENTR	
b.	00077		ENTR	
c.	00000		ENTR	
d. Press RSET pushbutton.				
177. Perform the following DSKY operations:				
a.	VERB 21	NOUN 01	ENTR	
b.	01300		ENTR	
c.	31304		ENTR	
d.	NOUN 15		ENTR	
e.	54067		ENTR	ENTR
f.	31305		ENTR	ENTR
g.	54001		ENTR	ENTR
h.	14613		ENTR	ENTR
i.	00067		ENTR	
j.	VERB 25	NOUN 26	ENTR	
k.	00001		ENTR	
l.	01300		ENTR	
m.	00000		ENTR	
n.	VERB 31		ENTR	
o. Observe that RESTART lamp on DSKY lights				
p.	VERB 01	NOUN 10	ENTR	
q.	00077		ENTR	
r. The contents of Row 1 on the DSKY shall be 00004 or 00104.				
178. Reset contents of Restart Monitor to zero by performing DSKY entries as follows:				
a.	VERB 21	NOUN 10	ENTR	
b.	00077		ENTR	
c.	00000		ENTR	
d. Press RSET pushbutton				

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179. Perform the following DSKY operations:

- a. VERB 25 NOUN 01 ENTR
- b. 01300 ENTR
- c. 00004 ENTR
- d. 30067 ENTR
- e. 01300 ENTR
- f. VERB 25 NOUN 26 ENTR
- g. 00001 ENTR
- h. 01300 ENTR
- i. 00000 ENTR
- j. VERB 31 ENTR
- k. Observe that the RESTART lamp on DSKY lights
- l. VERB 01 NOUN 10 ENTR
- m. 00077 ENTR
- n. The contents of Row 1 on the DSKY shall be 00010 or 00110.

180. Reset contents of Restart Monitor to zero by performing DSKY entries as follows:

- a. VERB 21 NOUN 10 ENTR
- b. 00077 ENTR
- c. 00000 ENTR

d. Press RSET pushbutton.

181. Perform the following DSKY operations:

- a. VERB 21 NOUN 01 ENTR
- b. 01300 ENTR
- c. 30000 ENTR
- d. NOUN 15 ENTR
- e. 01300 ENTR
- f. VERB 25 NOUN 26 ENTR
- g. 02000 ENTR
- h. 01300 ENTR
- i. 00000 ENTR
- j. VERB 30 ENTR

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- o. VERB 21 NOUN 01 ENTR
- p. 00322 ENTR
- r. 40002 ENTR
- s. Verify that lower spare lamp on DSKY is lighted and that VEL, ALT and upper spare lamp are not lit.
- t. Record response of DSKY displays on Data Sheet.
- u. VERB 36 ENTR
- 185. Perform the following DSKY operations:
  - a. VERB 11 NOUN 10 ENTR
  - b. 00032 ENTR
  - c. Verify that Row 1 of DSKY display is 7XXXX.
  - d. Press and hold PRO pushbutton until instructed to release pushbutton.
  - e. Verify that Row 1 of DSKY display changes to 5XXXX.
  - f. Release PRO pushbutton.
  - g. Verify that DSKY Row 1 display changes to 7XXXX.
  - h. Record response of DSKY display on Data sheet.
  - j. VERB 34 ENTR
  - 186. Perform the following DSKY operations:
    - a. VERB 01 NOUN 10 ENTR
    - b. 00077 ENTR
    - c. Verify contents of Row 1 of DSKY display is 00000.
    - d. Record display of Row 1 on DSKY on Data sheet.

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k. Observe that the RESTART lamp on the DSKY lights in approximately 2 seconds.

- l. VERB 01 NOUN 10 ENTR
- m. 00077 ENTR
- n. The contents of Row 1 on the DSKY shall be 00020 or 00120.

182. Reset contents of Restart Monitor to zero by performing DSKY entries as follows:

- a. VERB 21 NOUN 10 ENTR
- b. 00077 ENTR
- c. 00000 ENTR

d. Press RSET pushbutton.

183. Record compliance of DSKY displays for steps 175, 177, 179, and 181.

NOTE: The procedures of step 184 and step 185 apply only to G&N 604 and up.

184. Perform the following DSKY operations:

- a. VERB 36 ENTR
- b. VERB 21 NOUN 01 ENTR
- c. 00322 ENTR
- d. 40004 ENTR
- e. Verify that VEL lamp on DSKY is lighted.
- f. VERB 21 NOUN 01 ENTR
- g. 00322 ENTR
- h. 40020 ENTR
- j. Verify that ALT lamp on DSKY is lighted and VEL lamp is not lit.
- k. VERB 21 NOUN 01 ENTR
- l. 00322 ENTR
- m. 40001 ENTR
- n. Verify that upper spare lamp on DSKY is lighted and that VEL and ALT lamps are not lit.

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EQUIPMENT TEST  
DATA SHEET 1 OF 3

NO. 12617 JDC  
REV. T  
INITIAL TDRR 27134

ASSEMBLY UNDER TEST			TEST HISTORY		
TITLE	DATE	START	END	SITE / LOCATION	
SER. NO.	DWG	REV.	TIME	START	END
MAJOR GROUND SUPPORT EQUIPMENT					
CONDUCTED BY _____ APPROVED BY _____					
NAME _____ SER. NO. _____ CAL DATE _____					
NAME _____ SER. NO. _____ CAL DATE _____					
JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE
1 thru 135	Displays	All DSKY character and condition lamps required			
137	LGC self check failures				
141	IMU 28 vdc Bus	vdc	27.75	R1	28.25
144	gravity	cm/sec <sup>2</sup>	975.0	-----	995.9
146	Horizontal earth rate (R2)	ERU	See Table 1		See Table 1
148	IMU 28 vdc Bus	vdc	24.50		24.75
150	LGC self check failures				
152	gravity	cm/sec <sup>2</sup>	975.0		985.9
154	Horizontal earth rate (R2)	ERU	See Table 1		See Table 1

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JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ/ACC
156	IMU 28 vdc Bus	vdc	33.25		33.50	
158	LGC self check failures					
160	gravity	cm/sec <sup>2</sup>	975.0		985.9	
162	Horizontal earth rate (R2)	ERU	See Table 1		See Table 1	
183	Displays			All characters and lamps performed as required.		
184	Displays			DSKY lamps performed as required.		
185	Displays			DSKY Row 1 display performed as required.		
186	Displays			DSKY Row 1 display correct		

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Horizontal Earth Rate Tolerances		
Location	Min Value	Max Value
MIT	00000.64000	00000.84000
AC	00000.64000	00000.84000
MSC	00000.76000	00000.91000
NAA	00000.70000	00000.90000
MILA	00000.79000	00000.91000
GAEC	00000.65750	00000.85750

Table 1

COMMENTS:

DATE 15 MAR 66





TDRE 27134 M.R.15 1966

APOLLO 68N  
EQUIPMENT TEST  
DATA SHEET 1 OF 2

JDC  
NO. 12617  
REV. -  
INITIAL TOR

JOB G & N SYSTEM OPERATIONAL TEST

ASSEMBLY UNDER TEST		TEST HISTORY	
TITLE	DATE	START	END
SER. NO.	DWG	REV	SITE / LOCATION
MAJOR GROUND SUPPORT EQUIPMENT		TIME	TOTAL ELAPSED
NAME		SER. NO.	CAL DATE
NAME		SER. NO.	CAL DATE

CONDUCTED BY NAME/AFFILIATION APPROVED BY NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
1 thru 18	Displays	All DSKY character and condition lamps performed as required					
22	IMU 28 vdc Bus	vdc	27.75		R1 28.25		
25	gravity	cm/sec <sup>2</sup>	975.0		R2 985.9		
27	Horizontal earth rate (R2)	ERU	See Table 1		See Table 1		
29	IMU 28 vdc Bus	vdc	24.5		25.0		
30 (25)	gravity	cm/sec <sup>2</sup>	975.0		985.9		
30 (27)	Horizontal earth rate (R2)	ERU	See Table 1		See Table 1		
32	IMU 28 vdc Bus	vdc	33.5		33.75		
33 (25)	gravity	cm/sec <sup>2</sup>	975.0		985.9		

DATE

APOLLO 68N  
EQUIPMENT TEST  
DATA SHEET 2 OF 2

JDC  
NO. 12617  
REV. -

JOB G & N SYSTEM OPERATIONAL TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
33 (27)	Horizontal earth rate (R2)	ERU	See Table 1		See Table 1		

COMMENTS

DATE

Rev. Let.	Date	TDRR NO.	PAGES REVISED	APPROVAL	REFERENCES
A	3/19/68	27210	1-4	D.S. 1-7 MIT WK TM	
					IMPORTANT See Below:
					INTERVAL
					TOOLS AND MATERIAL

IMPORTANT: 1. Proceed with this JDC if the Operate Control test has been completed.  
2. Those signals listed on the Data Sheets which are starred (\*\*) must be corrected by a multiplication factor to obtain the true value.  
NOMINAL BUS VOLTAGE  
1. Establish a Master Initialization condition.  
2. Turn on System in accordance with the applicable turn on procedures.  
3. Connect the input bus to the Digital Voltmeter (DVM) by setting the CROSSBAR

VOLTAGE	CROSSBAR CONTROL
a. 800 cps 28V 1% supply	121
b. 800 cps 28V 5% supply	199
0° $\phi$ A PROBE TPA #2 TB5-37(hi)TB5-33(lo)	
c. 800 cps 28V 5% supply	199
90° $\phi$ B PROBE TPA #2 TB5-29(hi)TB5-33(lo)	

VERIFICATION WITH SIDL REQUIRED BEFORE USE DATE 18 JAN 68

VOLTAGE	CROSSBAR CONTROL
d. ECDU +4 VDC	118
e. -28 VDC supply	124
f. PTE (pulse Torque Electronics) supply 120 VDC output	259
g. X PIPA PVR supply 28 VDC output	195
h. Y PIPA PVR supply 28 VDC output	295
i. Z PIPA PVR supply 28 VDC output	196
j. 3200 cps 28 V feedback (Suspension power)	123
k. LGC +4 VDC	184
l. LGC +14.0 VDC	293
m. 23 VDC LGC Operate	193
n. 800 cps Reference Voltage	281
6. Set switches and controls on the Counter as follows: DISPLAY TIME (N <sub>2</sub> ) switch to 10 <sup>5</sup> DISPLAY RESET switch to ZERO CLOCK FREQUENCY DIVIDER switch to 10 CLOCK SELECTOR to INTERNAL INPUT SELECTOR switch to C SENSE SENSE SELECTOR to FWD ATTEN to 10 TRIGGER VOLTAGE fully ccw SAMPLE TIME (N <sub>1</sub> ) to 008000 FUNCTION switch to RATIO OR PERIOD	
7. Set COUNTER INPUT "D" SIGNAL selector on the Primary Signal Selector panel to 1.	

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Primary Signal Selector panel as indicated.  
SIGNAL CROSSBAR REFERENCE CONTROL VOLTAGE  
a. IMU 28V, 5% PROBE TPA #2 800 cps  $\phi$  A TB5-37(hi)TB5-33(lo)  
b. IMU 28V, 5% PROBE TPA #2 800 cps  $\phi$  B TB5-29(hi)TB5-33(lo)  
21. Calculate phase angle between 20.a and 20.b.  
LOW BUS VOLTAGE  
22. Repeat steps 3 through 21 adjusting for 24.25 (+0, -0.25)vdc in step 4.  
HIGH BUS VOLTAGE  
23. Repeat steps 3 through 21 adjusting for 33.25 (+0.25, -0)vdc in step 4.  
NORMALIZATION OF SYSTEM  
24. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 173.  
25. Adjust the G & N POWER ADJUST control on the Test Control panel until the DVM indicates an input bus voltage of 28.0 ( $\pm$ 0.25) vdc. Record indication.  
LGC +4VDC-BIAS 1 (ACE)  
26. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 194 and measure the voltage on the DVM. Record the indication.  
27. Press the INTERFACE LOAD TEST pushbutton on the Test Selector panel. The pushbutton shall light.  
28. Set the INTERFACE LOAD SELECTOR to position 7.  
29. Press the TEST START pushbutton. The pushbutton shall light.

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30. Set the CROSSBAR CONTROL to 194 and measure the voltage on the DVM. Record the indication.  
31. Press the TEST STOP pushbutton. The TEST START pushbutton shall go out.  
32. Calculate the LGC +4 VDC voltage change.  
LGC +14 VDC-BIAS 2 (ACE)  
33. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 293 and measure the voltage on the DVM. Record the indication.  
34. Press the INTERFACE LOAD TEST pushbutton on the Test Selector panel. The pushbutton shall light.  
35. Set the INTERFACE LOAD SELECTOR to position 8.  
36. Press the TEST START pushbutton. The pushbutton shall light.  
37. Set the CROSSBAR CONTROL to 293 and measure the voltage on the DVM. Record the indication.  
38. Press the TEST STOP pushbutton. The TEST START pushbutton shall go out.  
39. Calculate the LGC +14 VDC voltage change.

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APOLLO G & N  
EQUIPMENT TEST  
DATA SHEET 1 OF 7

JDC  
NO. 12618  
REV. A  
INITIAL TDRR 25 41

JOB LEM G & N SYSTEM POWER SUPPLIES TEST

ASSEMBLY UNDER TEST		TEST HISTORY	
TITLE	DATE	START	END
SER. NO.	DWG	REV.	SITE / LOCATION
MAJOR GROUND SUPPORT EQUIPMENT		START	END
NAME		SER. NO.	TOTAL ELAPSED
NAME		SER. NO.	
CONDUCTED BY		NAME/AFFILIATION	APPROVED BY
NAME/AFFILIATION		NAME/AFFILIATION	

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES			MAX VALUE	REJ ACC
				1st	2nd*	3rd*		
4	Nominal Bus Voltage	volts	27.75				28.25	
5.a	800 cps 28V 1% voltage	volts	27.44				28.56	
5.b	800 cps 28V 5% supply 0° $\phi$ A	volts	25.2				30.8	
5.c	800 cps 28V 5% supply 90° $\phi$ B	volts	25.9				30.1	
5.d	ECDU +4 VDC	volts	3.8				4.2	
5.e	-28 VDC	volts	-21.5				-33.5	
5.f	PTE supply 120 VDC	volts	114				126	
5.g	X PIPA PVR supply 28 VDC	volts	26.6				29.4	
5.h	Y PIPA PVR supply 28 VDC	volts	26.6				29.4	

\* TO BE USED AS REQUIRED OR DESIRED

DATE 18 JAN 66

APOLLO G & N  
EQUIPMENT TEST  
DATA SHEET 2 OF 7

JDC  
NO. 12618  
REV. A

JOB LEM G & N SYSTEM POWER SUPPLIES TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES			MAX VALUE	REJ ACC
				1st	2nd*	3rd*		
5.i	Z PIPA PVR supply 28 VDC	volts	26.6				29.4	
5.j	3200 cps 28V feedback	volts	28.03				29.17	
5.k	LGC +4 VDC	volts	3.85				4.15	
5.l	LGC +14.0 VDC	volts	13.8				14.2	
5.m	28 VDC LGC Operate	volts	26.8				28.2	
5.n	800 cps reference voltage	volts	27.44				28.56	
9.a	IMU 28V 800 cps 1%	counts	099875				100125	
9.b	28V 3200 cps feedback	counts	099968				100032	
10	Counter Indication	counts	099875				100125	
12	3200 pps	volts	3				10	
19	Time difference	p-p	0				9.0	
20.a	IMU 28V 5% 800 cps $\phi$ B	deg						
20.b	IMU 28V 5% 800 cps $\phi$ A	deg	-100				-80	
21	Phase angle $\phi$ A - $\phi$ B	deg	100				80	

\* TO BE USED AS REQUIRED OR DESIRED

DATE 18 JAN 66

APOLLO G & N  
EQUIPMENT TEST  
DATA SHEET 3 OF 7

JDC  
NO. 12618  
REV. A

JOB LEM G & N SYSTEM POWER SUPPLIES TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES			MAX VALUE	REJ ACC
				1st	2nd*	3rd*		
22	Low Bus Voltage	volts	24.50				24.75	
22	800 cps 28V 1%	volts	27.44				28.56	
22	800 cps 28V 5% supply 0° $\phi$ A	volts	25.2				30.8	
22	800 cps 28V 5% supply 90° $\phi$ B	volts	25.9				30.1	
22	ECDU +4 VDC	volts	3.8				4.2	
22	-28 VDC	volts	-21.5				-33.5	
22	PTE supply 120 VDC	volts	114				126	
22	X PIPA PVR supply 28 VDC	volts	26.6				29.4	
22	Y PIPA PVR supply 28 VDC	volts	26.6				29.4	
22	Z PIPA PVR supply 28 VDC	volts	26.6				29.4	
22	3200 cps 28V feedback	volts	28.03				29.17	
22	LGC +4 VDC	volts	3.85				4.15	

\* TO BE USED AS REQUIRED OR DESIRED

DATE 18 JAN 66

APOLLO G & N  
EQUIPMENT TEST  
DATA SHEET 4 OF 7

JDC  
NO. 12618  
REV. A

JOB LEM G & N SYSTEM POWER SUPPLIES TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES			MAX VALUE	REJ ACC
				1st	2nd*	3rd*		
22	LGC +14.0 VDC	volts	13.8				14.2	
22	28 VDC LGC operate	volts						
22	800 cps reference voltage	volts	26.60				29.40	
22	IMU 28V 800 cps 1%	counts	099875				100125	
22	28V 3200 cps feedback	counts	099968				100032	
22	Counter Indication	counts	099875				100125	
22	3200 pps	volts	3				10	
22	Time difference	p-p	0				9.0	
22	IMU 28V 5% 800 cps $\phi$ B	deg						
22	IMU 28V 5% 800 cps $\phi$ A	deg	-100				-80	
22	Phase angle $\phi$ A - $\phi$ B	deg	100				80	
23	High Bus Voltage	volts	33.25				33.50	

\* TO BE USED AS REQUIRED OR DESIRED

DATE 18 JAN 66

APOLLO G & N  
EQUIPMENT TEST  
DATA SHEET 5 OF 7

TEST HISTORY  
DATE START \_\_\_\_\_ END \_\_\_\_\_ SYSTEM NO. \_\_\_\_\_  
TIME START \_\_\_\_\_ OPERATOR \_\_\_\_\_

JDC  
NO. 12618  
REV. A

JOB LEM G & N SYSTEM POWER SUPPLIES TEST

JDC ITEM NO	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES	MAX VALUE	REJ ACC
				1st 2nd* 3rd*		
23 (5.a)	800 cps 28V 1%	volts	27.44		28.56	
23 (5.b)	800 cps 28V 5% supply 0° $\phi$ A	volts	25.2		30.8	
23 (5.c)	800 cps 28V 5% supply 90° $\phi$ B	volts	25.9		30.1	
23 (5.d)	ECDU +4 VDC	volts	3.8		4.2	
23 (5.e)	-28 VDC	volts	-21.5		-33.5	
23 (5.f)	PTE supply 120 VDC	volts	114		126	
23 (5.g)	X PIPA PVR supply 28 VDC	volts	26.6		29.4	
23 (5.h)	Y PIPA PVR supply 28 VDC	volts	26.6		29.4	
23 (5.i)	Z PIPA PVR supply 28 VDC	volts	26.6		29.4	
23 (5.j)	3200 cps 28V feedback	volts	28.03		29.17	
23 (5.k)	LGC +4 VDC	volts	3.85		4.15	
23 (5.l)	LGC +14.0 VDC	volts	13.8		14.2	

\* TO BE USED AS REQUIRED OR DESIRED

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APOLLO G & N  
EQUIPMENT TEST  
DATA SHEET 6 OF 7

TEST HISTORY  
DATE START \_\_\_\_\_ END \_\_\_\_\_ SYSTEM NO. \_\_\_\_\_  
TIME START \_\_\_\_\_ OPERATOR \_\_\_\_\_

JDC  
NO. 12618  
REV. A

JOB LEM G & N SYSTEM POWER SUPPLIES TEST

JDC ITEM NO	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES	MAX VALUE	REJ ACC
				1st 2nd* 3rd*		
23 (5.m)	28 VDC LGC operate	volts				
23 (5.n)	800 cps reference voltage	volts	26.60		29.40	
23 (9.a)	IMU 28V 800 cps 1%	counts	099875		100125	
23 (9.b)	28V 3200 cps feedback	counts	099968		100032	
23 (10)	Counter indication	counts	099875		100125	
23 (12)	3200 pps	volts	3		10	
23 (19)	Time difference	p-p $\mu$ sec	0		9.0	
23 (20.a)	IMU 28V 5% 800 cps $\phi$ B	deg				
23 (20.b)	IMU 28V 5% 800 cps $\phi$ A	deg	-100		-80	
23 (21)	Phase angle $\phi$ A - $\phi$ B	deg	100		80	
25	Nominal Bus Voltage	volts	27.75		28.25	
26	LGC +4 VDC	volts	3.85		4.15	(a)
30	BIAS 1 voltage	volts				(b)

\* TO BE USED AS REQUIRED OR DESIRED

DATE 18 JAN 66

APOLLO G & N  
EQUIPMENT TEST  
DATA SHEET 7 OF 7

TEST HISTORY  
DATE START \_\_\_\_\_ END \_\_\_\_\_ SYSTEM NO. \_\_\_\_\_  
TIME START \_\_\_\_\_ OPERATOR \_\_\_\_\_

JDC  
NO. 12618  
REV. A

JOB LEM G & N SYSTEM POWER SUPPLIES TEST

JDC ITEM NO	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES	MAX VALUE	REJ ACC
				1st 2nd* 3rd*		
32	Line a - line b	volts	0.20		0.4	
33	LGC +14 VDC	volts	13.8		14.2	(c)
37	BIAS 2 voltage	volts				(d)
39	Line c - line d	volts	0.80		1.0	

\* TO BE USED AS REQUIRED OR DESIRED

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Rev. Let.	Date	TDR NO.	PAGES REVISED	APPROVAL	REFERENCES
A	8-16-68	27210	ALL	WIT	NASA
B	8-16-68	27283	-	WKT	ACOM
				WKT	ACOM
					IMPORTANT
					See Below:
					INTERVAL
					TOOLS AND MATERIAL

IMPORTANT: 1. Proceed with this JDC if the Operate Control test has been completed.

- Those signals listed on the Data Sheets which are started (\*\*) must be corrected by a multiplication factor to obtain the true value.

NOMINAL BUS VOLTAGE  
1. Establish a Master Initialization condition.

- Turn on System in accordance with the applicable turn on procedures.
- Connect the input bus to the Digital Voltmeter (DVM) by setting the CROSSBAR

VERIFICATION WITH SIGNAL REQUIRED BEFORE USE

VOLTAGE	CROSSBAR CONTROL
a. 800 cps 28V 1% supply	121
b. 800 cps 28V 5% supply	199
0° $\delta$ A PROBE TPA #2	
c. 800 cps 28V 5% supply	199
90° $\delta$ B PROBE TPA #2	
TPB5-29(hi) TPB5-33(lo)	

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FORM 00144  
Chg. 1-23-65

- Set SCOPE B INPUT 2 selector on OSCILLOGRAPH SIGNAL SELECTOR to 5 and CHANNEL 5 to 7. Insure that CH5AC pushbutton is lighted.
- Set CH 1 and CH 2 switches on DUAL TRACE AMPLIFIERS OF OSCILLOSCOPE to AC. Set the VOLTS/DIV selector for CH 1 to 2 and CH 2 to 5.
- Pull out TRIGGER CH 1 ONLY switch on DUAL TRACE AMPLIFIER.
- Set the TIME BASE "B" controls as follows:  
TIME/DIV - .1 m sec  
TRIGGER - LOWER BEAM, INT  
COUPLING - AC FAST  
SLOPE - +  
LEVEL - to see trace  
B MODE - NORMAL TRIGGER
- Set switches CH 1 and CH 2 on the OSCILLOSCOPE to GND and position both traces to coincidence. Position the coincidence of sweeps to the center of the scope grid pattern.
- Set the TIME BASE "B" TIME/DIV control to 50  $\mu$  sec and pull 10X MAG POSITION control. Set CH 1 and CH 2 switches to AC.
- Measure and record the time difference between the leading edge of the 3200 PPS set pulse and the first positive going zero crossover of the 28V, 3200 cps signal.
- Measure and record the phase angle of signals listed below on the PAVM by setting the CROSSBAR CONTROL on the

- Primary Signal Selector panel as indicated, SIGNAL CROSSBAR REFERENCE CONTROL VOLTAGE  
a. IMU 28V, 5% PROBE TPA #2 800 cps  
800 cps  $\delta$  A TPB5-37(hi) TPB5-33(lo)  
b. IMU 28V, 5% PROBE TPA #2 800 cps  
800 cps  $\delta$  B TPB5-29(hi) TPB5-33(lo)  
21. Calculate phase angle between 20. a and 20. b.  
LOW BUS VOLTAGE  
22. Repeat steps 3 through 21 adjusting for 24.25 (+0, -0.25) vdc in step 4.  
HIGH BUS VOLTAGE  
23. Repeat steps 3 through 21 adjusting for 33.25 (+0.25, -0) vdc in step 4.  
NORMALIZATION OF SYSTEM  
24. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 173.  
25. Adjust the G & N POWER ADJUST control on the Test Control panel until the DVM indicates an input bus voltage of 28.0 (+0.5) vdc. Record indication.  
LGC +4VDC-BIAS 1 (ACE)  
26. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 194 and measure the voltage on the DVM. Record the indication.  
27. Press the INTERFACE LOAD TEST pushbutton on the Test Selector panel. The pushbutton shall light.  
28. Set the INTERFACE LOAD SELECTOR to position 7.  
29. Press the TEST START pushbutton. The pushbutton shall light.

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FORM 00144  
Chg. 1-23-65

- Adjust the ATTN D selector switch to the highest attenuation level that will cause triggering. Set the TRIGGER VOLTAGE control to insure that counter starts and subsequently stops in about 10 seconds. The Counter should indicate about 100000.
- Determine the frequencies of the following signals by setting the COUNTER INPUT "D" SIGNAL selector on the Primary Signal Selector panel and the SAMPLE TIME (N<sub>1</sub>) setting on the Counter as indicated. Record each reading.  
Signal "D" SIGNAL SAMPLE TIME Selector (N<sub>1</sub>) Setting  
a. IMU 28V 800 cps 1 008000  
b. 28V 3200 cps 5 032000  
Feedback (Suspension power)  
c. 800 cps Reference Voltage 281  
6. Set switches and controls on the Counter as follows:  
DISPLAY TIME (N<sub>2</sub>) switch to 10<sup>5</sup>  
DISPLAY RESET switch to ZERO  
CLOCK FREQUENCY DIVIDER switch to 10  
CLOCK SELECTOR to INTERNAL  
INPUT SELECTOR switch to C SENSE  
SENSE SELECTOR to FWD  
ATTN to 10  
TRIGGER VOLTAGE fully ccw  
SAMPLE TIME (N<sub>1</sub>) to 008000  
FUNCTION switch to RATIO OR PERIOD  
7. Set COUNTER INPUT "D" SIGNAL selector on the Primary Signal Selector panel to 1.

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FORM 00144  
Chg. 1-23-65

- Set the CROSSBAR CONTROL to 194 and measure the voltage on the DVM. Record the indication.  
31. Press the TEST STOP pushbutton. The TEST START pushbutton shall go out.  
32. Calculate the LGC +4 VDC voltage change.  
LGC +14 VDC-BIAS 2 (ACE)  
33. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 293 and measure the voltage on the DVM. Record the indication.  
34. Press the INTERFACE LOAD TEST pushbutton on the Test Selector panel. The pushbutton shall light.  
35. Set the INTERFACE LOAD SELECTOR to position 8.  
36. Press the TEST START pushbutton. The pushbutton shall light.  
37. Set the CROSSBAR CONTROL to 293 and measure the voltage on the DVM. Record the indication.  
38. Press the TEST STOP pushbutton. The TEST START pushbutton shall go out.  
39. Calculate the LGC +14 VDC voltage change.

APOLLO G & N  
EQUIPMENT TEST  
DATA SHEET 1 OF 7

JDC  
NO. 12618  
REV. B  
INITIAL TDRR 2524

JOB LEM G & N SYSTEM POWER SUPPLIES TEST

ASSEMBLY UNDER TEST		TEST HISTORY	
TITLE	DATE	START	END
SER. NO.	DWG	REV.	SITE / LOCATION
MAJOR GROUND SUPPORT EQUIPMENT			
NAME	SER. NO.	SER. NO.	CAL DATE
NAME	SER. NO.	SER. NO.	CAL DATE
CONDUCTED BY		APPROVED BY	
NAME/AFFILIATION		NAME/AFFILIATION	

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES	MAX VALUE	REJ ACC
				1st	2nd*	3rd*
4	Nominal Bus Voltage	volts	27.75			28.25
5.a	800 cps 28V 1%	volts	27.44			28.56
5.b **	800 cps 28V 5% supply 0° $\phi$ A	volts	25.2			30.8
5.c **	800 cps 28V 5% supply 90° $\phi$ B	volts	25.9			30.1
5.d	ECDU +4 VDC	volts	3.8			4.2
5.e	-28 VDC	volts	-21.5			-33.5
5.f	PTE supply 120 VDC	volts	114			126
5.g	X PIPA PVR supply 28 VDC	volts	26.6			29.4
5.h	Y PIPA PVR supply 28 VDC	volts	26.6			29.4

\* TO BE USED AS REQUIRED OR DESIRED

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FORM 1-601-5  
Chg. 7-25-65

APOLLO G & N  
EQUIPMENT TEST  
DATA SHEET 2 OF 7

JDC  
NO. 12618  
REV. B

JOB LEM G & N SYSTEM POWER SUPPLIES TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES	MAX VALUE	REJ ACC
				1st	2nd*	3rd*
5.i	Z PIPA PVR supply 28 VDC	volts	26.6			29.4
5.j	320 cps 28V feedback	volts	28.03			29.17
5.k	LGC +4 VDC	volts	3.85			4.15
5.l	LGC +14.0 VDC	volts	13.8			14.2
5.m	28 VDC LGC Operate	volts	26.8			28.2
5.n	800 cps reference voltage	volts	27.44			28.56
9.a	IMU 28V 800 cps 1%	counts	099875			100125
9.b	28V 3200 cps feedback	counts	099968			100032
10	Counter Indication	counts	099875			100125
12	3200 pps	volts	3			10
19	Time difference	$\mu$ sec	0			9.0
20.a	IMU 28V 5% 800 cps $\phi$ B	deg				
20.b	IMU 28V 5% 800 cps $\phi$ A	deg	-100			-80
21	Phase angle $\phi$ A - $\phi$ B	deg	100			80

\* TO BE USED AS REQUIRED OR DESIRED

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APOLLO G & N  
EQUIPMENT TEST  
DATA SHEET 3 OF 7

JDC  
NO. 12618  
REV. B

TEST HISTORY	
DATE	END
TIME	SYSTEM NO.
OPERATOR	

JOB LEM G & N SYSTEM POWER SUPPLIES TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES	MAX VALUE	REJ ACC
				1st	2nd*	3rd*
22 (4)	Low Bus Voltage	volts	24.50			24.75
22 (5.a)	800 cps 28V 1%	volts	27.44			28.56
22 ** (5.b)	800 cps 28V 5% supply 0° $\phi$ A	volts	25.2			30.8
22 ** (5.c)	800 cps 28V 5% supply 90° $\phi$ B	volts	25.9			30.1
22 (5.d)	ECDU +4 VDC	volts	3.8			4.2
22 (5.e)	-28 VDC	volts	-21.5			-33.5
22 (5.f)	PTE supply 120 VDC	volts	114			126
22 (5.g)	X PIPA PVR supply 28 VDC	volts	26.6			29.4
22 (5.h)	Y PIPA PVR supply 28 VDC	volts	26.6			29.4
22 (5.i)	Z PIPA PVR supply 28 VDC	volts	26.6			29.4
22 (5.j)	3200 cps 28V feedback	volts	28.03			29.17
22 (5.k)	LGC +4 VDC	volts	3.85			4.15

\* TO BE USED AS REQUIRED OR DESIRED

DATE 18 JAN 66

APOLLO G & N  
EQUIPMENT TEST  
DATA SHEET 4 OF 7

JDC  
NO. 12618  
REV. B

TEST HISTORY	
DATE	END
TIME	SYSTEM NO.
OPERATOR	

JOB LEM G & N SYSTEM POWER SUPPLIES TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES	MAX VALUE	REJ ACC
				1st	2nd*	3rd*
22 (5.l)	LGC +14.0 VDC	volts	13.8			14.2
22 (5.m)	28 VDC LGC Operate	volts				
22 (5.n)	800 cps reference voltage	volts	26.60			29.40
22 (9.a)	IMU 28V 800 cps 1%	counts	099875			100125
22 (9.b)	28V 3200 cps feedback	counts	099968			100032
22 (10)	Counter Indication	counts	099875			100125
22 (12)	3200 pps	volts	3			10
22 (19)	Time difference	$\mu$ sec	0			9.0
22 (20.a)	IMU 28V 5% 800 cps $\phi$ B	deg				
22 (20.b)	IMU 28V 5% 800 cps $\phi$ A	deg	-100			-80
22 (21)	Phase angle $\phi$ A - $\phi$ B	deg	100			80
23 (4)	High Bus Voltage	volts	33.25			33.50

\* TO BE USED AS REQUIRED OR DESIRED

DATE 18 JAN 66

APOLLO G & N  
EQUIPMENT TEST  
DATA SHEET 5 OF 7

TEST HISTORY  
DATE START \_\_\_\_\_ END \_\_\_\_\_  
TIME START \_\_\_\_\_ END \_\_\_\_\_  
OPERATOR \_\_\_\_\_ SYSTEM NO. \_\_\_\_\_

JDC  
NO. 12618  
REV. I

JOB LEM G & N SYSTEM POWER SUPPLIES TEST

JDC ITEM NO	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES			MAX VALUE	REJ/ACC
				1st	2nd*	3rd*		
23 (5.a)	800 cps 28V 1%	volts	27.44				28.56	
23 ** (5.b)	800 cps 28V 5% supply 0° $\phi$ A	volts	25.2				30.8	
23 ** (5.c)	800 cps 28V 5% supply 90° $\phi$ B	volts	25.9				30.1	
23 (5.d)	ECDU +4 VDC	volts	3.8				4.2	
23 (5.e)	-28 VDC	volts	-21.5				-33.5	
23 (5.f)	PTE supply 120 VDC	volts	114				126	
23 (5.g)	X PIPA PVR supply 28 VDC	volts	26.6				29.4	
23 (5.h)	Y PIPA PVR supply 28 VDC	volts	26.6				29.4	
23 (5.i)	Z PIPA PVR supply 28 VDC	volts	26.6				29.4	
23 (5.j)	3200 cps 28V feedback	volts	28.03				29.17	
23 (5.k)	LGC +4 VDC	volts	3.85				4.15	
23 (5.l)	LGC +14.0 VDC	volts	13.8				14.2	

\* TO BE USED AS REQUIRED OR DESIRED

DATE 18 JAN 66

APOLLO G & N  
EQUIPMENT TEST  
DATA SHEET 6 OF 7

TEST HISTORY  
DATE START \_\_\_\_\_ END \_\_\_\_\_  
TIME START \_\_\_\_\_ END \_\_\_\_\_  
OPERATOR \_\_\_\_\_ SYSTEM NO. \_\_\_\_\_

JDC  
NO. 12618  
REV. B

JOB LEM G & N SYSTEM POWER SUPPLIES TEST

JDC ITEM NO	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES			MAX VALUE	REJ/ACC
				1st	2nd*	3rd*		
23 (5.m)	28 VDC LGC Operate	volts						
23 (5.n)	800 cps reference voltage	volts	26.60				29.40	
23 (9.a)	IMU 28V 800 cps 1%	counts	099875				100125	
23 (9.b)	28V 3200 cps feedback	counts	099968				100032	
23 (10)	Counter indication	counts	099875				100125	
23 (12)	3200 pps	volts p-p	3				10	
23 (19)	Time difference	$\mu$ sec	0				9.0	
23 (20.a)	IMU 28V 5% 800 cps $\phi$ B	deg						
23 (20.b)	IMU 28V 5% 800 cps $\phi$ A	deg	-100				-80	
23 (21)	Phase angle $\phi$ A - $\phi$ B	deg	100				80	
25	Nominal Bus Voltage	volts	27.75				28.25	
26	LGC +4 VDC	volts	3.85				4.15	(a)
30	BIAS 1 voltage	volts						(b)

\* TO BE USED AS REQUIRED OR DESIRED

DATE 18 JAN 66

APOLLO G & N  
EQUIPMENT TEST  
DATA SHEET 7 OF 7

TEST HISTORY  
DATE START \_\_\_\_\_ END \_\_\_\_\_  
TIME START \_\_\_\_\_ END \_\_\_\_\_  
OPERATOR \_\_\_\_\_ SYSTEM NO. \_\_\_\_\_

JDC  
NO. 12618  
REV. B

JOB LEM G & N SYSTEM POWER SUPPLIES TEST

JDC ITEM NO	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES			MAX VALUE	REJ/ACC
				1st	2nd*	3rd*		
32	Line a - line b	volts	0.20				0.5	
33	LGC +14 VDC	volts	13.8				14.2	(c)
37	BIAS 2 voltage	volts						(d)
39	Line c - line d	volts	0.80				1.6	

\* TO BE USED AS REQUIRED OR DESIRED

DATE 18 JAN 66

SUBSYSTEM LEM G & N SYSTEM  
DESCRIPTION Power supply amplitude, frequency and phase relationship is checked.

ASSY.

Rev.	Let.	Date	TDRR NO.	PAGES REVISED	APPROVAL	REFERENCES
A	8-18-66	27210	ALL	D.S.	MIT NASA	
B	8-18-66	27253	7	ALL	WKA ACME	
C	4-26-66	28335	3	2, 3, 4, 6, 7	WKA ACME	IMPORTANT
						See Below:
						INTERVAL
						TOOLS AND MATERIAL

IMPORTANT: 1. Proceed with this JDC if the Operate Control test has been completed.

2. Those signals listed on the Data Sheets which are starred (\*\*) must be corrected by a multiplication factor to obtain the true value.

NOMINAL BUS VOLTAGE  
1. Establish a Master Initialization condition.

2. Turn on System in accordance with the applicable turn on procedures.

3. Connect the input bus to the Digital Voltmeter (DVM) by setting the CROSSBAR

CONTROL on the Primary Signal Selector panel to 173.

4. Adjust the G & N POWER ADJUST control on the Test Control panel until the DVM indicates an input bus voltage of 28.0 (+0.25) vdc. Record indication.

5. After the G & N SYSTEM has been in OPERATE for 15 minutes, set the Primary Signal Selector panel to monitor the following signals on the DVM and record each voltage.

VOLTAGE	CROSSBAR CONTROL
a. 800 cps 28V 1% supply	121
b. 800 cps 28V 5% supply	199
0° $\delta$ A	PROBE TPA #2
	TB5-37(hi)TB5-33(lo)
c. 800 cps 28V 5% supply	199
90° $\delta$ B	PROBE TPA #2
	TB5-29(hi)TB5-33(lo)

VERIFICATION WITH SID REQUIRED BEFORE USE  
DATE 18 JAN 66

REVISION  
CHG 7-66

SUBSYSTEM LEM G &amp; N SYSTEM

ASSY

8. Adjust the ATTN D selector switch to the highest attenuation level that will cause triggering. Set the TRIGGER VOLTAGE control to insure that counter starts and subsequently stops in about 10 seconds. The Counter should indicate about 100000.

9. Determine the frequencies of the following signals by setting the COUNTER INPUT "D" SIGNAL selector on the Primary Signal Selector panel and the SAMPLE TIME (N<sub>1</sub>) setting on the Counter as indicated. Record each reading.

Signal "D" SIGNAL SAMPLE TIME Selector (N<sub>1</sub>) Setting

s. IMU 28V 800 cps 1%	1	008000
b. 28V 3200 cps Feedback	5	032000
(Suspension power)		

10. Set the COUNTER INPUT D SIGNAL selector on the Primary Signal Selector panel to 15. Place a jumper from PROBES OUTPUT BUFFERED on the Auxiliary Input panel to COUNTER D Pulse In. Change the Counter SAMPLE TIME (N<sub>1</sub>) setting to 008000. Connect the buffered probe of TPA #2 to TB5 plus 37 (HI) and 33 (LO). Record Counter indication.

11. Connect a coax cable between Connectors J1-A and J4-F in the Auxiliary Input panel. Set the Oscilloscope to trigger "B" TIME BASE.

12. Using pulse probe, measure and record the peak to peak amplitude of 3200 PPS at TPA #2 TB1-6 (HI) and 1-9 (LO).

7. Set COUNTER INPUT "D" SIGNAL selector on the Primary Signal Selector panel to 1.

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ASSY

13. Set SCOPE B INPUT 2 selector on OSCILLOGRAPH SIGNAL SELECTOR to 5 and CHANNEL 5 to 7. Insure that CH5AC pushbutton is lighted.

14. Set CH 1 and CH 2 switches on DUAL TRACE AMPLIFIERS OF OSCILLOSCOPE to AC. Set the VOLTS/DIV selector for CH 1 to 2 and CH 2 to 5.

15. Pull out TRIGGER CH 1 ONLY switch on DUAL TRACE AMPLIFIER.

16. Set the TIME BASE "B" controls as follows:  
TIME/DIV - .1 m sec  
TRIGGER - LOWER BEAM, INT  
COUPLING - AC FAST  
SLOPE - +  
LEVEL - to see trace

17. Set switches CH 1 and CH 2 on the OSCILLOSCOPE to GND and position both traces to coincidence. Position the coincidence of sweeps to the center of the scope grid pattern.

18. Set the TIME BASE "B" TIME/DIV control to 50  $\mu$  sec and pull 10X MAG POSITION control. Set CH 1 and CH 2 switches to AC.

19. Measure and record the time difference between the leading edge of the 3200 PPS set pulse and the first positive going zero crossover of the 28V, 3200 cps signal.

20. Measure and record the phase angle of signals listed below on the PAVM by setting the CROSSBAR CONTROL on the

Primary Signal Selector panel as indicated.

SIGNAL	CROSSBAR REFERENCE CONTROL	VOLTAGE
--------	----------------------------	---------

a. IMU 28V, 5% PROBE TPA #2 800 cps  
800 cps  $\delta$  B TB5-29(hi)TB5-33(lo)

b. IMU 28V, 5% PROBE TPA #2 800 cps  
800 cps  $\delta$  A TB5-37(hi)TB5-33(lo)

21. Calculate phase angle between 20. a and 20. b.

22. Repeat steps 3 through 21 adjusting for 24.25 (+0, -0.25) vdc in step 4.

23. Repeat steps 3 through 21 adjusting for 33.25 (+0.25, -0) vdc in step 4.

24. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 173.

25. Adjust the G & N POWER ADJUST control on the Test Control panel until the DVM indicates an input bus voltage of 28.0 (+0.25) vdc. Record indication.

LGC +4VDC-BIAS 1 (ACE)

26. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 194 and measure the voltage on the DVM. Record the indication.

27. Press the INTERFACE LOAD TEST pushbutton on the Test Selector panel. The pushbutton shall light.

28. Set the INTERFACE LOAD SELECTOR to position 7.

29. Press the TEST START pushbutton. The pushbutton shall light.

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30. Set the CROSSBAR CONTROL to 194 and measure the voltage on the DVM. Record the indication.

31. Press the TEST STOP pushbutton. The TEST START pushbutton shall go out.

32. Calculate the LGC +4 VDC voltage change.

LGC +14 VDC-BIAS 2 (ACE)

33. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 293 and measure the voltage on the DVM. Record the indication.

34. Press the INTERFACE LOAD TEST pushbutton on the Test Selector panel. The pushbutton shall light.

35. Set the INTERFACE LOAD SELECTOR to position 8.

36. Press the TEST START pushbutton. The pushbutton shall light.

37. Set the CROSSBAR CONTROL to 293 and measure the voltage on the DVM. Record the indication.

38. Press the TEST STOP pushbutton. The TEST START pushbutton shall go out.

39. Calculate the LGC +14 VDC voltage change.

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FORM 00144  
Chg 1-23-65

DATE 18 JAN 66

FORM 00144  
Chg 1-23-65



APOLLO G&N  
EQUIPMENT TEST  
DATA SHEET 1 OF 7

JDC  
NO. 12618  
REV. C  
INITIAL TORR 25341

JOB LEM G & N SYSTEM POWER SUPPLIES TEST

ASSEMBLY UNDER TEST		TEST HISTORY	
TITLE	DATE	START	END
SER. NO.	DWG	REV.	SITE / LOCATION
MAJOR GROUND SUPPORT EQUIPMENT			
NAME	SER. NO.	CAL DATE	
NAME	SER. NO.	CAL DATE	
CONDUCTED BY		APPROVED BY	
NAME/AFFILIATION		NAME/AFFILIATION	

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES			MAX VALUE	REJ ACC
				1st	2nd*	3rd*		
4	Nominal Bus Voltage	volts	27.75				28.25	
5.a	800 cps 28V 1%	volts	27.44				28.56	
5.b **	800 cps 28V 5% supply 0° $\phi$ B	volts	25.2				30.8	
5.c **	800 cps 28V 5% supply 90° $\phi$ B	volts	25.9				30.1	
5.d	ECDU +4 VDC	volts	3.8				4.2	
5.e	-28 VDC	volts	-21.5				-33.5	
5.f	PTE supply 120 VDC	volts	114				126	
5.g	X PIPA PVR supply 28 VDC	volts	26.6				29.4	
5.h	Y PIPA PVR supply 28 VDC	volts	26.6				29.4	

\* TO BE USED AS REQUIRED OR DESIRED

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FORM 1-66-13  
CNS 7-20-63

APOLLO G & N  
EQUIPMENT TEST  
DATA SHEET 2 OF 7

JDC  
NO. 12618  
REV. C

JOB LEM G & N SYSTEM POWER SUPPLIES TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES			MAX VALUE	REJ ACC
				1st	2nd*	3rd*		
5.i	Z PIPA PVR supply 28 VDC	volts	26.6				29.4	
5.j	3200 cps 28V feedback	volts	28.03				29.17	
5.k	LGC +4 VDC	volts	3.85				4.15	
5.l	LGC +14.0 VDC	volts	13.8				14.2	
5.m	28 VDC LGC Operate	volts	26.8				28.2	
5.n	800 cps reference voltage	volts	27.44				28.56	
9.a	IMU 28V 800 cps 1%	counts	099875				100125	
9.b	28V 3200 cps feedback	counts	099968				100032	
10	Counter indication	counts	099875				100125	
12	3200 pps **	volts p-p	3				10	
19	Time difference	$\mu$ sec	0				9.0	
20.a	IMU 28V 5% 800 cps $\phi$ B	deg						
20.b	IMU 28V 5% 800 cps $\phi$ A	deg	-100				-80	
21	Phase angle $\phi$ A - $\phi$ B	deg	100				80	

\* TO BE USED AS REQUIRED OR DESIRED

\*\* Correct this measurement using "MULT BY" factor to obtain the true value.

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APOLLO G & N  
EQUIPMENT TEST  
DATA SHEET 3 OF 7

JDC  
NO. 12618  
REV. C

JOB LEM G & N SYSTEM POWER SUPPLIES TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES			MAX VALUE	REJ ACC
				1st	2nd*	3rd*		
22	Low Bus Voltage	volts	24.00				24.25	
22 (5.a)	800 cps 28V 1%	volts	27.44				28.56	
22 ** (5.b)	800 cps 28V 5% supply 0° $\phi$ A	volts	25.2				30.8	
22 ** (5.c)	800 cps 28V 5% supply 90° $\phi$ B	volts	25.9				30.1	
22 (5.d)	ECDU +4 VDC	volts	3.8				4.2	
22 (5.e)	-28 VDC	volts	-21.5				-33.5	
22 (5.f)	PTE supply 120 VDC	volts	114				126	
22 (5.g)	X PIPA PVR supply 28 VDC	volts	26.6				29.4	
22 (5.h)	Y PIPA PVR supply 28 VDC	volts	26.6				29.4	
22 (5.i)	Z PIPA PVR supply 28 VDC	volts	26.6				29.4	
22 (5.j)	3200 cps 28V feedback	volts	28.03				29.17	
22 (5.k)	LGC +4 VDC	volts	3.85				4.15	

\* TO BE USED AS REQUIRED OR DESIRED

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FORM 1-66-13  
CNS 7-20-63

APOLLO G & N  
EQUIPMENT TEST  
DATA SHEET 4 OF 7

JDC  
NO. 12618  
REV. C

JOB LEM G & N SYSTEM POWER SUPPLIES TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES			MAX VALUE	REJ ACC
				1st	2nd*	3rd*		
22 (5.l)	LGC +14.0 VDC	volts	13.8				14.2	
22 (5.m)	28 VDC LGC Operate	volts						
22 (5.n)	800 cps reference voltage	volts	26.60				29.40	
22 (9.a)	IMU 28V 800 cps 1%	counts	099875				100125	
22 (9.b)	28V 3200 cps feedback	counts	099968				100032	
22 (10)	Counter indication	counts	099875				100125	
22 (12)	3200 pps **	volts p-p	3				10	
22 (19)	Time difference	$\mu$ sec	0				9.0	
22 (20.a)	IMU 28V 5% 800 cps $\phi$ B	deg						
22 (20.b)	IMU 28V 5% 800 cps $\phi$ A	deg	-100				-80	
22 (21)	Phase angle $\phi$ A - $\phi$ B	deg	100				80	
23 (4)	High Bus Voltage	volts	33.25				33.50	

\* TO BE USED AS REQUIRED OR DESIRED

\*\* Correct this measurement using "MULT BY" factor to obtain the true value.

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APOLLO G & N  
EQUIPMENT TEST  
DATA SHEET 5 OF 7

TEST HISTORY  
DATE START \_\_\_\_\_ END \_\_\_\_\_  
TIME START \_\_\_\_\_ TIME END \_\_\_\_\_  
OPERATOR \_\_\_\_\_ SYSTEM NO. \_\_\_\_\_

JDC  
NO. 12618  
REV. C

JOB LEM G & N SYSTEM POWER SUPPLIES TEST

JDC ITEM NO	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES	MAX VALUE	REJ ACC
				1st 2nd* 3rd*		
23 (5.a)	800 cps 28V 1%	volts	27.44		28.56	
23 ** (5.b)	800 cps 28V 5% supply 0° $\phi$ A	volts	25.2		30.8	
23 ** (5.c)	800 cps 28V 5% supply 90° $\phi$ B	volts	25.9		30.1	
23 (5.d)	ECDU +4 VDC	volts	3.8		4.2	
23 (5.e)	-28 VDC	volts	-21.5		-33.5	
23 (5.f)	PTE supply 120 VDC	volts	114		126	
23 (5.g)	X PIPA PVR supply 28 VDC	volts	26.6		29.4	
23 (5.h)	Y PIPA PVR supply 28 VDC	volts	26.6		29.4	
23 (5.i)	Z PIPA PVR supply 28 VDC	volts	26.6		29.4	
23 (5.j)	3200 cps 28V feedback	volts	28.03		29.17	
23 (5.k)	LGC +4 VDC	volts	3.85		4.15	
23 (5.l)	LGC +14.0 VDC	volts	13.8		14.2	

\* TO BE USED AS REQUIRED OR DESIRED

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APOLLO G & N  
EQUIPMENT TEST  
DATA SHEET 6 OF 7

TEST HISTORY  
DATE START \_\_\_\_\_ END \_\_\_\_\_  
TIME START \_\_\_\_\_ TIME END \_\_\_\_\_  
OPERATOR \_\_\_\_\_ SYSTEM NO. \_\_\_\_\_

JDC  
NO. 12618  
REV. C

JOB LEM G & N SYSTEM POWER SUPPLIES TEST

JDC ITEM NO	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES	MAX VALUE	REJ ACC
				1st 2nd* 3rd*		
23 (5.m)	28 VDC LGC Operate	volts				
23 (5.n)	800 cps reference voltage	volts	26.60		29.40	
23 (9.a)	IMU 28V 800 cps 1%	counts	099875		100125	
23 (9.b)	28V 3200 cps feedback	counts	099968		100032	
23 (10)	Counter Indication	counts	099875		100125	
23 (12)	3200 pps ** p-p	volts	3		10	
23 (19)	Time difference	$\mu$ sec	0		9.0	
23 (20.a)	IMU 28V 5% 800 cps $\phi$ B	deg				
23 (20.b)	IMU 28V 5% 800 cps $\phi$ A	deg	-100		-80	
23 (21)	Phase angle $\phi$ A - $\phi$ B	deg	100		80	
25	Nominal Bus Voltage	volts	27.75		28.25	
26	LGC +4 VDC	volts	3.85		4.15	
30	BIAS 1 voltage	volts				

\* TO BE USED AS REQUIRED OR DESIRED

\*\* Correct this measurement using "MULT BY" factor to obtain the true value.

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APOLLO G & N  
EQUIPMENT TEST  
DATA SHEET 7 OF 7

TEST HISTORY  
DATE START \_\_\_\_\_ END \_\_\_\_\_  
TIME START \_\_\_\_\_ TIME END \_\_\_\_\_  
OPERATOR \_\_\_\_\_ SYSTEM NO. \_\_\_\_\_

JDC  
NO. 12618  
REV. C

JOB LEM G & N SYSTEM POWER SUPPLIES TEST

JDC ITEM NO	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES	MAX VALUE	REJ ACC
				1st 2nd* 3rd*		
32	Line a - line b	volts	0.4		1.0	
33	LGC +14 VDC	volts	13.8		14.2	
37	BIAS 2 voltage	volts				
39	Line c - line d	volts	1.0		5.0	

\* TO BE USED AS REQUIRED OR DESIRED

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APOLLO G & N  
EQUIPMENT TEST  
DATA SHEET 1 OF 7

JDC  
NO. 12618  
REV. D  
INITIAL TORR 25311

JOB LEM G & N SYSTEM POWER SUPPLIES TEST

ASSEMBLY UNDER TEST		TEST HISTORY	
TITLE	DATE	START	END
SER. NO.	DWG	REV.	SITE / LOCAT. ON
MAJOR GROUND SUPPORT EQUIPMENT		TIME	END
		START	TOTAL ELAPSED
NAME	SER. NO.	SER. NO.	CAL DATE
NAME	SER. NO.	SER. NO.	CAL DATE
CONDUCTED BY NAME/AFFILIATION APPROVED BY NAME/AFFILIATION			

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES	MAX VALUE	REJ ACC
				1st 2nd* 3rd*		
4	Nominal Bus Voltage	volts	27.75		28.25	
5.a	800 cps 28V 1% supply $\phi$ B	volts	27.44		28.56	
5.b **	800 cps 28V 5% supply $\phi$ B	volts	25.9		30.1	
5.c **	800 cps 28V 5% supply $\phi$ A	volts	26.6		29.4	
5.d	ECDU +4 VDC	volts	3.8		4.2	
5.e	-28 VDC	volts	-21.5		-33.5	
5.f	PTE supply 120 VDC	volts	114		126	
5.g	X PIPA PVR supply 28 VDC	volts	26.6		29.4	
5.h	Y PIPA PVR supply 28 VDC	volts	26.6		29.4	

\* TO BE USED AS REQUIRED OR DESIRED

DATE 18 JAN 66

APOLLO G & N  
EQUIPMENT TEST  
DATA SHEET 2 OF 7

JDC  
NO. 12618  
REV. D

JOB LEM G & N SYSTEM POWER SUPPLIES TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES	MAX VALUE	REJ ACC
				1st 2nd* 3rd*		
5.i	Z PIPA PVR supply 28 VDC	volts	26.6		29.4	
5.j	3200 cps 28V feedback	volts	28.03		29.17	
5.k	LGC +4 VDC	volts	3.85		4.15	
5.l	LGC +14.0 VDC	volts	13.8		14.2	
5.m	28 VDC LGC Operate	volts	26.8		28.2	
5.n	800 cps reference voltage	volts	27.44		28.56	
9.a	IMU 28V 800 cps 1%	counts	099875		100125	
9.b	28V 3200 cps feedback	counts	099968		100032	
10	Counter indication	counts	099875		100125	
12	3200 pps **	volts p-p	3		10	
19	Time difference	$\mu$ sec	0		9.0	
20.a	IMU 28V 5% 800 cps $\phi$ B	deg	160		200	
20.b	IMU 28V 5% 800 cps $\phi$ A	deg	-100		-80	
21	Phase angle $\phi$ A - $\phi$ B	deg	100		80	

\* TO BE USED AS REQUIRED OR DESIRED

\*\* Correct this measurement using "MULT BY" factor to obtain the true value.

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APOLLO G & N  
EQUIPMENT TEST  
DATA SHEET 3 OF 7

JDC  
NO. 12618  
REV. D

TEST HISTORY	
DATE	END
TIME	END
START	SYSTEM NO.
OPERATOR	

JOB LEM G & N SYSTEM POWER SUPPLIES TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES	MAX VALUE	REJ ACC
				1st 2nd* 3rd*		
22 (4)	Low Bus Voltage	volts	24.00		24.25	
22 (5.a)	800 cps 28V 1%	volts	27.44		28.56	
22 ** (5.b)	800 cps 28V 5% supply $\phi$ B	volts	25.9		30.1	
22 ** (5.c)	800 cps 28V 5% supply $\phi$ A	volts	26.6		29.4	
22 (5.d)	ECDU +4 VDC	volts	3.8		4.2	
22 (5.e)	-28 VDC	volts	-21.5		-33.5	
22 (5.f)	PTE supply 120 VDC	volts	114		126	
22 (5.g)	X PIPA PVR supply 28 VDC	volts	26.6		29.4	
22 (5.h)	Y PIPA PVR supply 28 VDC	volts	26.6		29.4	
22 (5.i)	Z PIPA PVR supply 28 VDC	volts	26.6		29.4	
22 (5.j)	3200 cps 28V feedback	volts	28.03		29.17	
22 (5.k)	LGC +4 VDC	volts	3.85		4.15	

\* TO BE USED AS REQUIRED OR DESIRED

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APOLLO G & N  
EQUIPMENT TEST  
DATA SHEET 4 OF 7

JDC  
NO. 12618  
REV. D

TEST HISTORY	
DATE	END
TIME	END
START	SYSTEM NO.
OPERATOR	

JOB LEM G & N SYSTEM POWER SUPPLIES TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES	MAX VALUE	REJ ACC
				1st 2nd* 3rd*		
22 (5.l)	LGC +14.0 VDC	volts	13.8		14.2	
22 (5.m)	28 VDC LGC Operate	volts	26.80		29.40	
22 (5.n)	800 cps reference voltage	volts	26.80		29.40	
22 (9.a)	IMU 28V 800 cps 1%	counts	099875		100125	
22 (9.b)	28V 3200 cps feedback	counts	099968		100032	
22 (10)	Counter indication	counts	099875		100125	
22 (12)	3200 pps **	volts p-p	3		10	
22 (19)	Time difference	$\mu$ sec	0		9.0	
22 (20.a)	IMU 28V 5% 800 cps $\phi$ B	deg	160		200	
22 (20.b)	IMU 28V 5% 800 cps $\phi$ A	deg	-100		-80	
22 (21)	Phase angle $\phi$ A - $\phi$ B	deg	100		80	
23 (4)	High Bus Voltage	volts	33.25		35.50	

\* TO BE USED AS REQUIRED OR DESIRED

\*\* Correct this measurement using "MULT BY" factor to obtain the true value.

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APOLLO G & N  
EQUIPMENT TEST  
DATA SHEET 5 OF 7

TEST HISTORY  
DATE START \_\_\_\_\_ END \_\_\_\_\_ SYSTEM NO. \_\_\_\_\_  
TIME START \_\_\_\_\_ END \_\_\_\_\_ OPERATOR \_\_\_\_\_

JDC  
NO. 12618  
REV. D

JOB LEM G & N SYSTEM POWER SUPPLIES TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES	MAX VALUE	REJ ACC
				1st 2nd* 3rd*		
23 (5.a)	800 cps 28V 1%	volts	27.44		28.56	
23 ** (5.b)	800 cps 28V 5% supply $\phi$ B	volts	25.9		30.1	
23 ** (5.c)	800 cps 28V 5% supply $\phi$ A	volts	26.6		29.4	
23 (5.d)	ECDU +4 VDC	volts	3.8		4.2	
23 (5.e)	-28 VDC	volts	-21.5		-33.5	
23 (5.f)	PTE supply 120 VDC	volts	114		126	
23 (5.g)	X PIPA PVR supply 28 VDC	volts	26.6		29.4	
23 (5.h)	Y PIPA PVR supply 28 VDC	volts	26.6		29.4	
23 (5.i)	Z PIPA PVR supply 28 VDC	volts	26.6		29.4	
23 (5.j)	3200 cps 28V feedback	volts	28.03		29.17	
23 (5.k)	LGC +4 VDC	volts	3.85		4.15	
23 (5.l)	LGC +14.0 VDC	volts	13.8		14.2	

\* TO BE USED AS REQUIRED OR DESIRED

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APOLLO G & N  
EQUIPMENT TEST  
DATA SHEET 6 OF 7

TEST HISTORY  
DATE START \_\_\_\_\_ END \_\_\_\_\_ SYSTEM NO. \_\_\_\_\_  
TIME START \_\_\_\_\_ END \_\_\_\_\_ OPERATOR \_\_\_\_\_

JDC  
NO. 12618  
REV. D

JOB LEM G & N SYSTEM POWER SUPPLIES TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES	MAX VALUE	REJ ACC
				1st 2nd* 3rd*		
23 (5.m)	28 VDC LGC Operate	volts				
23 (5.n)	800 cps reference voltage	volts	26.60		29.40	
23 (9.a)	IMU 28V 800 cps 1%	counts	099875		100125	
23 (9.b)	28V 3200 cps feedback	counts	099968		100032	
23 (10)	Counter indication	counts	099875		100125	
23 (12)	3200 pps **	volts p-p	3		10	
23 (19)	Time difference	$\mu$ sec	0		9.0	
23 (20.a)	IMU 28V 5% 800 cps $\phi$ B	deg	160		200	
23 (20.b)	IMU 28V 5% 800 cps $\phi$ A	deg	-100		-80	
23 (21)	Phase angle $\phi$ A - $\phi$ B	deg	100		80	
25	Nominal Bus Voltage	volts	27.75		28.25	
26	LGC +4 VDC	volts	3.85		4.15	(a)
30	BIAS 1 voltage	volts				(b)

\* TO BE USED AS REQUIRED OR DESIRED

\*\* Correct this measurement using "MULT BY" factor  
to obtain the true value.

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APOLLO G & N  
EQUIPMENT TEST  
DATA SHEET 7 OF 7

TEST HISTORY  
DATE START \_\_\_\_\_ END \_\_\_\_\_ SYSTEM NO. \_\_\_\_\_  
TIME START \_\_\_\_\_ END \_\_\_\_\_ OPERATOR \_\_\_\_\_

JDC  
NO. 12613  
REV. D

JOB LEM G & N SYSTEM POWER SUPPLIES TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES	MAX VALUE	REJ ACC
				1st 2nd* 3rd*		
32	Line a - line b	volts	0.4		1.0	
33	LGC +14 VDC	volts	13.8		14.2	(c)
37	BIAS 2 voltage	volts				(d)
39	Line c - line d	volts	1.0		5.0	

\* TO BE USED AS REQUIRED OR DESIRED

DATE 18 JAN 66

SUBSYSTEM LEM G & N SYSTEM  
DESCRIPTION Power supply amplitude, frequency and phase relationship is checked.

Rev.	Date	TORR NO.	PAGES REVISED	APPROVAL	REFERENCES
A	8-16-66	27210	ALL	MIT	NASA
B	9-16-66	27283	-	WK 2	ACM 2
C	4-26-66	28355	3	WK 3	ACM 3
D	8-29-66	29849	1-3	WK 4	-
E	8-5-66	30533	1	EA 2	-
					See Below:
					INTERVAL
					TOOLS AND MATERIAL

IMPORTANT: 1. Proceed with this JDC if the Operate Control test has been completed.

2. Those signals listed on the Data Sheets which are starred (\*\*) must be corrected by a multiplication factor to obtain the true value.

NOMINAL BUS VOLTAGE  
1. Establish a Master Initialization condition.

2. Turn on System in accordance with the applicable turn on procedures.

3. Connect the input bus to the Digital Voltmeter (DVM) by setting the CROSSBAR

VERIFICATION WITH SIDL REQUIRED BEFORE USE  
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CONTROL on the Primary Signal Selector panel to 173.

4. Adjust the G & N POWER ADJUST control on the Test Control panel until the DVM indicates an input bus voltage of 28.0 ( $\pm 0.25$ ) vdc. Record indication.

5. After the G & N SYSTEM has been in OPERATE for 15 minutes, set the Primary Signal Selector panel to monitor the following signals on the DVM and record each voltage.

VOLTAGE	CROSSBAR CONTROL
a. 800 cps 28V 1% supply	121
b. 800 cps 28V 5% supply	199
Probe TPA #2 TB5-29 (h) TB5-33 (lo)	
c. 800 cps 28V 5% supply	199
Probe TPA #2 TB5-37 (h) TB5-33 (lo)	

SUBSYSTEM LEM G & N SYSTEM

Primary Signal Selector panel as indicated.

13. Set SCOPE B INPUT 2 selector on OSCILLOGRAPH SIGNAL SELECTOR to 5 and CHANNEL 5 to 7. Insure that CH5AC pushbutton is lighted.

14. Set CH 1 and CH 2 switches on DUAL TRACE AMPLIFIERS OF OSCILLOSCOPE to AC. Set the VOLTS/DIV selector for CH 1 to 2 and CH 2 to 5.

15. Pull out TRIGGER CH 1 ONLY switch on DUAL TRACE AMPLIFIER.

16. Set the TIME BASE "B" controls as follows:

TIME/DIV - .1 m sec

TRIGGER - LOWER BEAM, INT

COUPLING - AC FAST

SLOPE - +

LEVEL - to see trace

B MODE - NORMAL TRIGGER

17. Set switches CH 1 and CH 2 on the OSCILLOSCOPE to GND and position both traces to coincidence. Position the coincidence of sweeps to the center of the scope grid pattern.

18. Set the TIME BASE "B" TIME/DIV control to 50  $\mu$  sec and pull 10X MAG POSITION control. Set CH 1 and CH 2 switches to AC.

19. Measure and record the time difference between the leading edge of the 3200 PPS set pulse and the first positive going zero crossover of the 28V, 3200 cps signal.

20. Measure and record the phase angle of signals listed below on the PAVM by setting the CROSSBAR CONTROL on the

SUBSYSTEM LEM G & N SYSTEM

Primary Signal Selector panel to 194 and measure the voltage on the DVM. Record the indication.

30. Set the CROSSBAR CONTROL to 194 and measure the voltage on the DVM. Record the indication.

31. Press the TEST STOP pushbutton. The TEST START pushbutton shall go out.

32. Calculate the LGC +4 VDC voltage change.

LGC +14 VDC-BIAS 2 (ACE)

33. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 293 and measure the voltage on the DVM. Record the indication.

34. Press the INTERFACE LOAD TEST pushbutton on the Test Selector panel. The pushbutton shall light.

35. Set the INTERFACE LOAD SELECTOR to position 8.

36. Press the TEST START pushbutton. The pushbutton shall light.

37. Set the CROSSBAR CONTROL to 293 and measure the voltage on the DVM. Record the indication.

38. Press the TEST STOP pushbutton. The TEST START pushbutton shall go out.

39. Calculate the LGC +14 VDC voltage change.

SUBSYSTEM LEM G & N SYSTEM

Primary Signal Selector panel to 194 and measure the voltage on the DVM. Record the indication.

8. Adjust the ATEN D selector switch to the highest attenuation level that will cause triggering. Set the TRIGGER VOLTAGE control to insure that counter starts and subsequently stops in about 10 seconds. The Counter should indicate about 100000.

9. Determine the frequencies of the following signals by setting the COUNTER INPUT "D" SIGNAL selector on the Primary Signal Selector panel and the SAMPLE TIME (N1) setting on the Counter as indicated. Record each reading.

VOLTAGE	CROSSBAR CONTROL
d. ECDU +4 VDC	118
e. -28 VDC supply	124
f. PTE (pulse Torque Electronics) supply 120 VDC output	259
g. X PIPA PVR supply 28 VDC output	195
h. Y PIPA PVR supply 28 VDC output	295
i. Z PIPA PVR supply 28 VDC output	196

Signal "D" SIGNAL SAMPLE TIME Selector (N1) Setting

a. IMU 28V 800 cps 1% 008000

b. 28V 3200 cps Feedback (Suspension power) 5 032000

10. Set the COUNTER INPUT D SIGNAL selector on the Primary Signal Selector panel to 15. Place a jumper from PROBES OUTPUT BUFFERED on the Auxiliary Input panel to COUNTER Pulse In. Change the Counter SAMPLE TIME (N1) setting to 008000. Connect the buffered probe of TPA #2 to TB5 plus 37 (HI) and 33 (LO). Record Counter indication.

11. Connect a coax cable between Connectors J1-A and J4-F in the Auxiliary Input panel. Set the Oscilloscope to trigger "B" TIME BASE.

12. Using pulse probe, measure and record the peak to peak amplitude of 3200 PPS at TPA #2 TB1-6 (HI) and 1-9 (LO).

7. Set COUNTER INPUT "D" SIGNAL selector on the Primary Signal Selector panel to 1.

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FORM 4-60 (14)  
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APOLLO G & N  
EQUIPMENT TEST  
DATA SHEET 1 OF 7

JDC  
NO. 12618  
REV. E  
INITIAL TDDR 25311

APOLLO G & N  
EQUIPMENT TEST  
DATA SHEET 2 OF 7

JDC  
NO. 12618  
REV. E

JOB LEM G & N SYSTEM POWER SUPPLIES TEST

ASSEMBLY UNDER TEST		TEST HISTORY	
TITLE	DATE	START	END
SER. NO.	DWG	REV.	SITE / LOCAT ON
MAJOR GROUND SUPPORT EQUIPMENT		TIME	START
NAME		END	TOTAL ELAPSED
NAME		SER. NO.	CAL DATE
NAME		SER. NO.	CAL DATE
CONDUCTED BY		APPROVED BY	
NAME/AFFILIATION		NAME/AFFILIATION	

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES			MAX VALUE	REJ ACC
				1st	2nd*	3rd*		
4	Nominal Bus Voltage	volts	27.75				28.25	
5.a	800 cps 28V 1% Voltage	volts	27.44				28.56	
5.b **	800 cps 28V 5% supply $\phi$ B	volts	25.9				30.1	
5.c **	800 cps 28V 5% supply $\phi$ A	volts	26.6				29.4	
5.d	ECDU +4 VDC	volts	3.8				4.2	
5.e	-28 VDC	volts	-21.5				-33.5	
5.f	PTE supply 120 VDC	volts	114				126	
5.g	X PIPA PVR supply 23 VDC	volts	26.6				29.4	
5.h	Y PIPA PVR supply 28 VDC	volts	26.6				29.4	

\* TO BE USED AS REQUIRED OR DESIRED

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APOLLO G & N  
EQUIPMENT TEST  
DATA SHEET 3 OF 7

JDC  
NO. 12618  
REV. E

JDC  
NO. 12618  
REV. E

JOB LEM G & N SYSTEM POWER SUPPLIES TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES			MAX VALUE	REJ ACC
				1st	2nd*	3rd*		
22 (4)	Low Bus Voltage	volts	24.00				24.25	
22 (5.a)	800 cps 28V 1% Voltage	volts	27.44				28.56	
22 ** (5.b)	800 cps 28V 5% supply $\phi$ B	volts	25.9				30.1	
22 ** (5.c)	800 cps 28V 5% supply $\phi$ A	volts	26.6				29.4	
22 (5.d)	ECDU +4 VDC	volts	3.8				4.2	
22 (5.e)	-28 VDC	volts	-21.5				-33.5	
22 (5.f)	PTE supply 120 VDC	volts	114				126	
22 (5.g)	X PIPA PVR supply 28 VDC	volts	26.6				29.4	
22 (5.h)	Y PIPA PVR supply 28 VDC	volts	26.6				29.4	
22 (5.i)	Z PIPA PVR supply 28 VDC	volts	26.6				29.4	
22 (5.j)	3200 cps 28V feedback	volts	28.03				29.17	
22 (5.k)	LGC +4 VDC	volts	3.85				4.15	

\* TO BE USED AS REQUIRED OR DESIRED

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JOB LEM G & N SYSTEM POWER SUPPLIES TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES			MAX VALUE	REJ ACC
				1st	2nd*	3rd*		
5.i	Z PIPA PVR supply 28 VDC	volts	26.6				29.4	
5.j	3200 cps 28V feedback	volts	28.03				29.17	
5.k	LGC +4 VDC	volts	3.85				4.15	
5.l	LGC +14.0 VDC	volts	13.8				14.2	
5.m	28 VDC LGC Operate	volts	26.8				28.2	
5.n	800 cps reference voltage	volts	27.44				28.56	
9.a	IMU 28V 800 cps 1%	counts	099875				100125	
9.b	28V 3200 cps feedback	counts	099968				100032	
10	Counter Indication	counts	099875				100125	
12	3200 pps **	volts p-p	3				10	
19	Time difference	$\mu$ sec	0				9.0	
20.a	IMU 28V 5% 800 cps $\phi$ B	deg	160				200	
20.b	IMU 28V 5% 800 cps $\phi$ A	deg	-100				-80	
21	Phase angle $\phi$ A - $\phi$ B	deg	100				80	

\* TO BE USED AS REQUIRED OR DESIRED

\*\* Correct this measurement using "MULT BY" factor to obtain the true value.

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APOLLO G & N  
EQUIPMENT TEST  
DATA SHEET 4 OF 7

JDC  
NO. 12618  
REV. E

JDC  
NO. 12618  
REV. E

JOB LEM G & N SYSTEM POWER SUPPLIES TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES			MAX VALUE	REJ ACC
				1st	2nd*	3rd*		
22 (5.l)	LGC +14.0 VDC	volts	13.8				14.2	
22 (5.m)	28 VDC LGC Operate	volts						
22 (5.n)	800 cps reference voltage	volts	26.60				29.40	
22 (9.a)	IMU 28V 800 cps 1%	counts	099875				100125	
22 (9.b)	28V 3200 cps feedback	counts	099968				100032	
22 (10)	Counter Indication	counts	099875				100125	
22 (12)	3200 pps **	volts p-p	3				10	
22 (19)	Time difference	$\mu$ sec	0				9.0	
22 (20.a)	IMU 28V 5% 800 cps $\phi$ B	deg	160				200	
22 (20.b)	IMU 28V 5% 800 cps $\phi$ A	deg	-100				-80	
22 (21)	Phase angle $\phi$ A - $\phi$ B	deg	100				80	
23 (4)	High Bus Voltage	volts	33.25				33.50	

\* TO BE USED AS REQUIRED OR DESIRED

\*\* Correct this measurement using "MULT BY" factor to obtain the true value.

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APOLLO G & N  
EQUIPMENT TEST  
DATA SHEET 5 OF 7

TEST HISTORY  
DATE START \_\_\_\_\_ END \_\_\_\_\_  
TIME START \_\_\_\_\_ END \_\_\_\_\_  
OPERATOR \_\_\_\_\_ SYSTEM NO. \_\_\_\_\_

JDC  
NO. 12618  
REV. E

JOB LEM G & N SYSTEM POWER SUPPLIES TEST

JDC ITEM NO	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES	MAX VALUE	REJ ACC
				1st 2nd* 3rd*		
23 (5.a)	800 cps 28V 1%	volts	27.44		28.56	
23 ** (5.b)	800 cps 28V 5% supply # B	volts	25.9		30.1	
23 ** (5.c)	800 cps 28V 5% supply # A	volts	26.6		29.4	
23 (5.d)	ECDU +4 VDC	volts	3.8		4.2	
23 (5.e)	-28 VDC	volts	-21.5		-33.5	
23 (5.f)	PTE supply 120 VDC	volts	114		126	
23 (5.g)	X PIPA PVR supply 28 VDC	volts	26.6		29.4	
23 (5.h)	Y PIPA PVR supply 28 VDC	volts	26.6		29.4	
23 (5.i)	Z PIPA PVR supply 28 VDC	volts	26.6		29.4	
23 (5.j)	3200 cps 28V feedback	volts	28.03		29.17	
23 (5.k)	LGC +4 VDC	volts	3.85		4.15	
23 (5.l)	LGC +14.0 VDC	volts	13.8		14.2	

\* TO BE USED AS REQUIRED OR DESIRED

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APOLLO G & N  
EQUIPMENT TEST  
DATA SHEET 6 OF 7

TEST HISTORY  
DATE START \_\_\_\_\_ END \_\_\_\_\_  
TIME START \_\_\_\_\_ END \_\_\_\_\_  
OPERATOR \_\_\_\_\_ SYSTEM NO. \_\_\_\_\_

JDC  
NO. 12618  
REV. E

JOB LEM G & N SYSTEM POWER SUPPLIES TEST

JDC ITEM NO	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES	MAX VALUE	REJ ACC
				1st 2nd* 3rd*		
23 (5.m)	28 VDC LGC Operate	volts				
23 (5.n)	800 cps reference voltage	volts	26.60		29.40	
23 (9.a)	IMU 28V 800 cps 1%	counts	099875		100125	
23 (9.b)	28V 3200 cps feedback	counts	099968		100032	
23 (10)	Counter indication	counts	099875		100125	
23 (12)	3200 pps **	volts p-p	3		10	
23 (19)	Time difference	$\mu$ sec	0		9.0	
23 (20.a)	IMU 28V 5% 800 cps # B	deg	160		200	
23 (20.b)	IMU 28V 5% 800 cps # A	deg	-100		-80	
23 (21)	Phase angle # A - # B	deg	100		80	
25	Nominal Bus Voltage	volts	27.75		28.25	
26	LGC +4 VDC	volts	3.85		4.15	(a)
30	BIAS 1 voltage	volts				(b)

\* TO BE USED AS REQUIRED OR DESIRED

\*\* Correct this measurement using "MULT BY" factor  
to obtain the true value.

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APOLLO G & N  
EQUIPMENT TEST  
DATA SHEET 7 OF 7

TEST HISTORY  
DATE START \_\_\_\_\_ END \_\_\_\_\_  
TIME START \_\_\_\_\_ END \_\_\_\_\_  
OPERATOR \_\_\_\_\_ SYSTEM NO. \_\_\_\_\_

JDC  
NO. 12618  
REV. E

JOB LEM G & N SYSTEM POWER SUPPLIES TEST

JDC ITEM NO	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES	MAX VALUE	REJ ACC
				1st 2nd* 3rd*		
32	Line a - line b	volts	0.4		1.0	
33	LGC +14 VDC	volts	13.8		14.2	
37	BIAS 2 voltage	volts				(c)
39	Line c - line d	volts	1.0		5.0	(d)

\* TO BE USED AS REQUIRED OR DESIRED

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SUBSYSTEM LEM G & N SYSTEM  
DESCRIPTION Power supply amplitude, frequency and phase relationship is checked.

Rev. Let.	Date	TORR NO.	PAGES REVISED	APPROVAL	REFERENCES
A	8-16-66	27210	ALL	MIT NASA	
B	8-16-66	27283	7	WK 23 ACN 17	
C	4-26-66	28385	3	2, 3, 4, 6, 7 WK 23	IMPORTANT
D	6-28-66	29849	1, 3	MM 15	See Below:
E	8-5-66	30533	1	EA 3	
F	2-2-67	32888	1, 2	EA 3	INTERVAL
					TOOLS AND MATERIAL

IMPORTANT: 1. Proceed with this JDC if the Operator Control test has been completed.  
2. Those signals listed on the Data Sheets which are started (\*\*) must be corrected by a multiplication factor to obtain the true value.  
3. Insure the PAVM switch on the Primary Signal Selector panel is set to OFF when the PAVM is not required for voltage measurements.  
NOMINAL BUS VOLTAGE

- Perform JDC 12613 to establish a Master Initialization condition.
- Turn on System in accordance with the applicable turn on procedures.
- Connect the input bus to the Digital Voltmeter (DVM) by setting the CROSSBAR

VERIFICATION WITH SID REQUIRED BEFORE USE

- VOLTAGE CROSSBAR CONTROL
- Adjust the ATTEN D selector switch to the highest attenuation level that will cause triggering. Set the TRIGGER VOLTAGE control to insure that counter starts and subsequently stops in about 10 seconds. The Counter should indicate about 100000.
  - Determine the frequencies of the following signals by setting the COUNTER INPUT "D" SIGNAL selector on the Primary Signal Selector panel and the SAMPLE TIME (N<sub>1</sub>) setting on the Counter as indicated. Record each reading.

Signal	"D" SIGNAL SAMPLE TIME Selector (N <sub>1</sub> ) Setting
a. IMU 28V 800 cps 1%	1 008000
b. 28V 3200 cps Feedback (Suspension power)	5 032000
  - Set the COUNTER INPUT "D" SIGNAL selector on the Primary Signal Selector panel to 15. Place a jumper from PROBES OUTPUT BUFFERED on the Auxiliary Input panel to COUNTER D Pulse In. Change the Counter SAMPLE TIME (N<sub>1</sub>) setting to 008000. Connect the buffered probe of TPA #2 to TB5 plus 37 (HI) and 33 (LO). Record Counter indication.
  - Connect a coax cable between Connectors J1-A and J4-F in the Auxiliary Input panel. Set the Oscilloscope to trigger "B" TIME BASE.
  - Using pulse probe, measure and record the peak to peak amplitude of 3200 PPS at TPA #2 TB1-6 (HI) and 1-9 (LO).
7. Set COUNTER INPUT "D" SIGNAL selector on the Primary Signal Selector panel to 1.

- Primary Signal Selector panel as indicated.
- SIGNAL CROSSBAR REFERENCE CONTROL VOLTAGE
- IMU 28V, 5% PROBE TPA #2 800 cps # B TB5-29 (HI) TB5-33 (LO)
  - IMU 28V, 5% PROBE TPA #2 800 cps # A TB5-37 (HI) TB5-33 (LO)
21. Calculate phase angle between 20.a and 20.b.
- LOW BUS VOLTAGE
22. Repeat steps 3 through 21 adjusting for 24.25 (+0, -0.25) vdc in step 4.
- HIGH BUS VOLTAGE
23. Repeat steps 3 through 21 adjusting for 33.25 (+0.25, -0) vdc in step 4.
- NORMALIZATION OF SYSTEM
24. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 173.
25. Adjust the G & N POWER ADJUST control on the Test Control panel until the DVM indicates an input bus voltage of 28.0 (+0.25) vdc. Record indication.
- LGC +4VDC-BIAS 1 (ACE)
26. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 194 and measure the voltage on the DVM. Record the indication.
27. Press the INTERFACE LOAD TEST pushbutton on the Test Selector panel. The pushbutton shall light.
28. Set the INTERFACE LOAD SELECTOR to position 7.
29. Press the TEST START pushbutton. The pushbutton shall light.

30. Set the CROSSBAR CONTROL to 194 and measure the voltage on the DVM. Record the indication.
31. Press the TEST STOP pushbutton. The TEST START pushbutton shall go out.
32. Calculate the LGC +4 VDC voltage change.
- LGC +14 VDC-BIAS 2 (ACE)
33. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 293 and measure the voltage on the DVM. Record the indication.
34. Press the INTERFACE LOAD TEST pushbutton on the Test Selector panel. The pushbutton shall light.
35. Set the INTERFACE LOAD SELECTOR to position 8.
36. Press the TEST START pushbutton. The pushbutton shall light.
37. Set the CROSSBAR CONTROL to 293 and measure the voltage on the DVM. Record the indication.
38. Press the TEST STOP pushbutton. The TEST START pushbutton shall go out.
39. Calculate the LGC +14 VDC voltage change.



APOLLO G & N  
EQUIPMENT TEST  
DATA SHEET 1 OF 7

JDC  
NO. 12618  
REV. F  
INITIAL TDRR 28/41

JOB LEM G & N SYSTEM POWER SUPPLIES TEST

ASSEMBLY UNDER TEST		TEST HISTORY	
TITLE	DATE	START	END
SER. NO.	DWG	REV.	SITE / LOCATION
MAJOR GROUND SUPPORT EQUIPMENT		TIME	TOTAL ELAPSED
NAME		SER. NO.	CAL DATE
NAME		SER. NO.	CAL DATE
CONDUCTED BY		APPROVED BY	
NAME/AFFILIATION		NAME/AFFILIATION	

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES			MAX VALUE	REJ ACC
				1st	2nd*	3rd*		
4	Nominal Bus Voltage	volts	27.75				28.25	
5.a	800 cps 28V 1%	volts	27.44				28.56	
5.b **	800 cps 28V 5% supply $\phi$ B	volts	25.9				30.1	
5.o **	800 cps 28V 5% supply $\phi$ A	volts	26.6				29.4	
5.d	ECDU +4 VDC	volts	3.8				4.2	
5.e	-28 VDC	volts	-21.5				-33.5	
5.f	PTE supply 120 VDC	volts	114				126	
5.g	X PIPA PVR supply 28 VDC	volts	26.6				29.4	
5.h	Y PIPA PVR supply 28 VDC	volts	26.6				29.4	

\* TO BE USED AS REQUIRED OR DESIRED

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APOLLO G & N  
EQUIPMENT TEST  
DATA SHEET 2 OF 7

JDC  
NO. 12618  
REV. F

JOB LEM G & N SYSTEM POWER SUPPLIES TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES			MAX VALUE	REJ ACC
				1st	2nd*	3rd*		
5.i	Z PIPA PVR supply 28 VDC	volts	26.6				29.4	
5.j	3200 cps 28V feedback	volts	28.03				29.17	
5.k	LGC +4 VDC	volts	3.85				4.15	
5.l	LGC +14.0 VDC	volts	13.8				14.2	
5.m	28 VDC LGC Operate	volts	26.8				28.2	
5.n	800 cps reference voltage	volts	27.44				28.56	
9.a	IMU 28V 800 cps 1%	counts	099875				100125	
9.b	28V 3200 cps feedback	counts	099968				100032	
10	Counter Indication	counts	099875				100125	
12	3200 pps **	volts	3				10	
19	Time difference	$\mu$ sec	0				9.0	
20.a	IMU 28V 5% 800 cps $\phi$ B	deg	160				200	
20.b	IMU 28V 5% 800 cps $\phi$ A	deg	-100				-80	
21	Phase angle $\phi$ A - $\phi$ B	deg	100				80	

\* TO BE USED AS REQUIRED OR DESIRED

\*\* Correct this measurement using "MULT BY" factor to obtain the true value.

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APOLLO G & N  
EQUIPMENT TEST  
DATA SHEET 3 OF 7

JDC  
NO. 12618  
REV. F

TEST HISTORY	
DATE	END
TIME	SYSTEM NO.
OPERATION	

JOB LEM G & N SYSTEM POWER SUPPLIES TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES			MAX VALUE	REJ ACC
				1st	2nd*	3rd*		
22 (4)	Low Bus Voltage	volts	24.00				24.25	
22 (5.a)	800 cps 28V 1%	volts	27.44				28.56	
22 ** (5.b)	800 cps 28V 5% supply $\phi$ B	volts	25.9				30.1	
22 ** (5.c)	800 cps 28V 5% supply $\phi$ A	volts	26.6				29.4	
22 (5.d)	ECDU +4 VDC	volts	3.8				4.2	
22 (5.e)	-28 VDC	volts	-21.5				-33.5	
22 (5.f)	PTE supply 120 VDC	volts	114				126	
22 (5.g)	X PIPA PVR supply 28 VDC	volts	26.6				29.4	
22 (5.h)	Y PIPA PVR supply 28 VDC	volts	26.6				29.4	
22 (5.i)	Z PIPA PVR supply 28 VDC	volts	26.6				29.4	
22 (5.j)	3200 cps 28V feedback	volts	28.03				29.17	
22 (5.k)	LGC +4 VDC	volts	3.85				4.15	

\* TO BE USED AS REQUIRED OR DESIRED

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APOLLO G & N  
EQUIPMENT TEST  
DATA SHEET 4 OF 7

JDC  
NO. 12618  
REV. F

TEST HISTORY	
DATE	END
TIME	SYSTEM NO.
OPERATION	

JOB LEM G & N SYSTEM POWER SUPPLIES TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES			MAX VALUE	REJ ACC
				1st	2nd*	3rd*		
22 (5.l)	LGC +14.0 VDC	volts	13.8				14.2	
22 (5.m)	28 VDC LGC Operate	volts						
22 (5.n)	800 cps reference voltage	volts	26.60				29.40	
22 (9.a)	IMU 28V 800 cps 1%	counts	099875				100125	
22 (9.b)	28V 3200 cps feedback	counts	099968				100032	
22 (10)	Counter Indication	counts	099875				100125	
22 (12)	3200 pps **	volts	3				10	
22 (19)	Time difference	$\mu$ sec	0				9.0	
22 (20.a)	IMU 28V 5% 800 cps $\phi$ B	deg	160				200	
22 (20.b)	IMU 28V 5% 800 cps $\phi$ A	deg	-100				-80	
22 (21)	Phase angle $\phi$ A - $\phi$ B	deg	100				80	
23 (4)	High Bus Voltage	volts	33.25				33.50	

\* TO BE USED AS REQUIRED OR DESIRED

\*\* Correct this measurement using "MULT BY" factor to obtain the true value.

DATE 18 JAN 66

FOR I O 149  
Chg. 7-23-65

APOLLO G & N  
EQUIPMENT TEST  
DATA SHEET 1 OF 7

JDC  
NO. 12618  
REV. F  
INITIAL TDRR 25 41

JOB LEM G & N SYSTEM POWER SUPPLIES TEST

ASSEMBLY UNDER TEST		TEST HISTORY	
TITLE	DATE	START	END
SER. NO.	DWG	REV.	SITE / LOCATION
MAJOR GROUND SUPPORT EQUIPMENT			
NAME	SER. NO.	CAL DATE	
NAME	SER. NO.	CAL DATE	
CONDUCTED BY		APPROVED BY	
NAME/AFFILIATION		NAME/AFFILIATION	

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES			MAX VALUE	REJ ACC
				1st	2nd*	3rd*		
4	Nominal Bus Voltage	volts	27.75				28.25	
5.a	800 cps 28V 1%	volts	27.44				28.56	
5.b **	800 cps 28V 5% supply # B	volts	25.9				30.1	
5.c **	800 cps 28V 5% supply # A	volts	26.6				29.4	
5.d	ECDU +4 VDC	volts	3.8				4.2	
5.e	-28 VDC	volts	-21.5				-33.5	
5.f	PTE supply 120 VDC	volts	114				126	
5.g	X PIPA PVR supply 28 VDC	volts	26.6				29.4	
5.h	Y PIPA PVR supply 28 VDC	volts	26.6				29.4	

\* TO BE USED AS REQUIRED OR DESIRED

DATE 18 JAN 66

FOR 10149  
CH 1: 7-13-65

APOLLO G & N  
EQUIPMENT TEST  
DATA SHEET 2 OF 7

JDC  
NO. 12618  
REV. F

JOB LEM G & N SYSTEM POWER SUPPLIES TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES			MAX VALUE	REJ ACC
				1st	2nd*	3rd*		
5.i	Z PIPA PVR supply 28 VDC	volts	26.6				29.4	
5.j	3200 cps 28V feedback	volts	28.08				29.17	
5.k	LGC +4 VDC	volts	3.85				4.15	
5.l	LGC +14.0 VDC	volts	13.8				14.2	
5.m	28 VDC LGC Operate	volts	26.8				28.2	
5.n	800 cps reference voltage	volts	27.44				28.56	
9.a	IMU 28V 800 cps 1%	counts	099875				100125	
9.b	28V 3200 cps feedback	counts	099968				100032	
10	Counter indication	counts	099875				100125	
12	3200 pps **	volts	3				10	
19	Time difference	μsec	0				9.0	
20.a	IMU 28V 5% 800 cps #B	deg	160				200	
20.b	IMU 28V 5% 800 cps #A	deg	-100				-80	
21	Phase angle #A - #B	deg	100				80	

\* TO BE USED AS REQUIRED OR DESIRED

\*\* Correct this measurement using "MULT BY" factor to obtain the true value.

DATE 18 JAN 66

FOR 10149  
CH 1: 7-13-65

APOLLO G & N  
EQUIPMENT TEST  
DATA SHEET 3 OF 7

JDC  
NO. 12618  
REV. F

TEST HISTORY	
DATE	START
TIME	END
OPERATOR	SYSTEM NO.

JOB LEM G & N SYSTEM POWER SUPPLIES TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES			MAX VALUE	REJ ACC
				1st	2nd*	3rd*		
22 (4)	Low Bus Voltage	volts	24.00				24.25	
22 (5.a)	800 cps 28V 1%	volts	27.44				28.56	
22 ** (5.b)	800 cps 28V 5% supply # B	volts	25.9				30.1	
22 ** (5.c)	800 cps 28V 5% supply # A	volts	26.6				29.4	
22 (5.d)	ECDU +4 VDC	volts	3.8				4.2	
22 (5.e)	-28 VDC	volts	-21.5				-33.5	
22 (5.f)	PTE supply 120 VDC	volts	114				126	
22 (5.g)	X PIPA PVR supply 28 VDC	volts	26.6				29.4	
22 (5.h)	Y PIPA PVR supply 28 VDC	volts	26.6				29.4	
22 (5.i)	Z PIPA PVR supply 28 VDC	volts	26.6				29.4	
22 (5.j)	3200 cps 28V feedback	volts	28.08				29.17	
22 (5.k)	LGC +4 VDC	volts	3.85				4.15	

\* TO BE USED AS REQUIRED OR DESIRED

DATE 18 JAN 66

FOR 10149  
CH 1: 7-13-65

APOLLO G & N  
EQUIPMENT TEST  
DATA SHEET 4 OF 7

JDC  
NO. 12618  
REV. F

TEST HISTORY	
DATE	START
TIME	END
OPERATOR	SYSTEM NO.

JOB LEM G & N SYSTEM POWER SUPPLIES TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES			MAX VALUE	REJ ACC
				1st	2nd*	3rd*		
22 (5.l)	LGC +14.0 VDC	volts	13.8				14.2	
22 (5.m)	28 VDC LGC Operate	volts						
22 (5.n)	800 cps reference voltage	volts	26.60				29.40	
22 (9.a)	IMU 28V 800 cps 1%	counts	099875				100125	
22 (9.b)	28V 3200 cps feedback	counts	099968				100032	
22 (10)	Counter indication	counts	099875				100125	
22 (12)	3200 pps **	volts	3				10	
22 (19)	Time difference	μsec	0				9.0	
22 (20.a)	IMU 28V 5% 800 cps # B	deg	160				200	
22 (20.b)	IMU 28V 5% 800 cps #A	deg	-100				-80	
22 (21)	Phase angle #A - #B	deg	100				80	
23 (4)	High Bus Voltage	volts	33.25				33.50	

\* TO BE USED AS REQUIRED OR DESIRED

\*\* Correct this measurement using "MULT BY" factor to obtain the true value.

DATE 18 JAN 66

FOR 10149  
CH 1: 7-13-65



APOLLO G & N  
EQUIPMENT TEST  
DATA SHEET 5 OF 7

TEST HISTORY  
DATE START \_\_\_\_\_ END \_\_\_\_\_  
TIME START \_\_\_\_\_ END \_\_\_\_\_  
OPERATOR \_\_\_\_\_ SYSTEM NO. \_\_\_\_\_

JDC  
NO. 12618  
REV. F

JOB LEM G & N SYSTEM POWER SUPPLIES TEST

JDC ITEM NO	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES	MAX VALUE	REJ ACC
				1st 2nd* 3rd*		
23 (5.a)	800 cps 28V 1%	volts	27.44		28.56	
23 ** (5.b)	800 cps 28V 5% supply $\phi$ B	volts	26.9		30.1	
23 ** (5.c)	800 cps 28V 5% supply $\phi$ A	volts	26.6		29.4	
23 (5.d)	ECDU +4 VDC	volts	3.8		4.2	
23 (5.e)	-28 VDC	volts	-21.5		-33.5	
23 (5.f)	PTE supply 120 VDC	volts	114		126	
23 (5.g)	X PIPA PVR supply 28 VDC	volts	26.6		29.4	
23 (5.h)	Y PIPA PVR supply 28 VDC	volts	26.6		29.4	
23 (5.i)	Z PIPA PVR supply 28 VDC	volts	26.6		29.4	
23 (5.j)	3200 cps 28V feedback	volts	28.03		29.17	
23 (5.k)	LGC +4 VDC	volts	3.85		4.15	
23 (5.l)	LGC +14.0 VDC	volts	13.8		14.2	

\* TO BE USED AS REQUIRED OR DESIRED

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12618  
NO. 12618  
REV. F

APOLLO G & N  
EQUIPMENT TEST  
DATA SHEET 6 OF 7

TEST HISTORY  
DATE START \_\_\_\_\_ END \_\_\_\_\_  
TIME START \_\_\_\_\_ END \_\_\_\_\_  
OPERATOR \_\_\_\_\_ SYSTEM NO. \_\_\_\_\_

JDC  
NO. 12618  
REV. F

JOB LEM G & N SYSTEM POWER SUPPLIES TEST

JDC ITEM NO	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES	MAX VALUE	REJ ACC
				1st 2nd* 3rd*		
23 (5.m)	28 VDC LGC Operate	volts				
23 (5.n)	800 cps reference voltage	volts	26.60		28.40	
23 (9.a)	IMU 28V 800 cps 1%	counts	099875		100125	
23 (9.b)	28V 3200 cps feedback	counts	099968		100032	
23 (10)	Counter indication	counts	099875		100125	
23 (12)	3200 pps **	volts	3		10	
23 (19)	Time difference	$\mu$ sec	0		9.0	
23 (20.a)	IMU 28V 5% 800 cps $\phi$ B	deg	160		200	
23 (20.b)	IMU 28V 5% 800 cps $\phi$ A	deg	-100		-80	
23 (21)	Phase angle $\phi$ A - $\phi$ B	deg	100		80	
25	Nominal Bus Voltage	volts	27.75		28.25	
26	LGC +4 VDC	volts	3.85		4.15	
30	BIAS 1 voltage	volts				

\* TO BE USED AS REQUIRED OR DESIRED

\*\* Correct this measurement using "MULT BY" factor  
to obtain the true value.

DATE 18 JAN 66

12618  
NO. 12618  
REV. F

APOLLO G & N  
EQUIPMENT TEST  
DATA SHEET 7 OF 7

TEST HISTORY  
DATE START \_\_\_\_\_ END \_\_\_\_\_  
TIME START \_\_\_\_\_ END \_\_\_\_\_  
OPERATOR \_\_\_\_\_ SYSTEM NO. \_\_\_\_\_

JDC  
NO. 12618  
REV. F

JOB LEM G & N SYSTEM POWER SUPPLIES TEST

JDC ITEM NO	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES	MAX VALUE	REJ ACC
				1st 2nd* 3rd*		
32	Line a - line b	volts	0.4		1.0	
33	LGC +14 VDC	volts	13.8		14.2	
37	BIAS 2 voltage	volts				
39	Line c - line d	volts	1.0		5.0	

\* TO BE USED AS REQUIRED OR DESIRED

DATE 18 JAN 66

12618  
NO. 12618  
REV. F

APOLLO G & N  
EQUIPMENT TEST  
DATA SHEET 5 OF 7

TEST HISTORY  
DATE START \_\_\_\_\_ END \_\_\_\_\_  
TIME START \_\_\_\_\_ END \_\_\_\_\_  
OPERATOR \_\_\_\_\_ SYSTEM NO. \_\_\_\_\_

JDC  
NO. 12613  
REV. F

JOB LEM G & N SYSTEM POWER SUPPLIES TEST

JDC ITEM NO	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES			MAX VALUE	REJ ACC
				1st	2nd*	3rd*		
23 (5.a)	800 cps 28V 1%	volts	27.44				28.56	
23 ** (5.b)	800 cps 28V 5% supply $\phi$ B	volts	25.9				30.1	
23 ** (5.c)	800 cps 28V 5% supply $\phi$ A	volts	26.6				29.4	
23 (5.d)	ECDU +4 VDC	volts	3.8				4.2	
23 (5.e)	-28 VDC	volts	-21.5				-33.5	
23 (5.f)	PTE supply 120 VDC	volts	114				126	
23 (5.g)	X PIPA PVR supply 28 VDC	volts	26.6				29.4	
23 (5.h)	Y PIPA PVR supply 28 VDC	volts	26.6				29.4	
23 (5.i)	Z PIPA PVR supply 28 VDC	volts	26.6				29.4	
23 (5.j)	3200 cps 28V feedback	volts	28.03				29.17	
23 (5.k)	LGC +4 VDC	volts	3.85				4.15	
23 (5.l)	LGC +14.0 VDC	volts	13.8				14.2	

\* TO BE USED AS REQUIRED OR DESIRED

DATE 18 JAN 66  
10:55 AM '66  
N.W. 9 (20-5)

APOLLO G & N  
EQUIPMENT TEST  
DATA SHEET 6 OF 7

TEST HISTORY  
DATE START \_\_\_\_\_ END \_\_\_\_\_  
TIME START \_\_\_\_\_ END \_\_\_\_\_  
OPERATOR \_\_\_\_\_ SYSTEM NO. \_\_\_\_\_

JDC  
NO. 12618  
REV. F

JOB LEM G & N SYSTEM POWER SUPPLIES TEST

JDC ITEM NO	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES			MAX VALUE	REJ ACC
				1st	2nd*	3rd*		
23 (5.m)	28 VDC LGC Operate	volts						
23 (5.n)	800 cps reference voltage	volts	26.60				29.40	
23 (9.a)	IMU 28V 800 cps 1%	counts	099875				100125	
23 (9.b)	28V 3200 cps feedback	counts	099968				100032	
23 (10)	Counter indication	counts	099875				100125	
23 (12)	3200 pps **	volts p-p	3				10	
23 (19)	Time difference	$\mu$ sec	0				9.0	
23 (20.a)	IMU 28V 5% 800 cps $\phi$ B	deg	160				200	
23 (20.b)	IMU 28V 5% 800 cps $\phi$ A	deg	-100				-80	
23 (21)	Phase angle $\phi$ A - $\phi$ B	deg	100				80	
25	Nominal Bus Voltage	volts	27.75				28.25	
26	LGC +4 VDC	volts	3.85				4.15	(a)
30	BIAS 1 voltage	volts						(b)

\* TO BE USED AS REQUIRED OR DESIRED

\*\* Correct this measurement using "MULT BY" factor  
to obtain the true value.

DATE 18 JAN 66  
10:55 AM '66  
N.W. 9 (20-5)

APOLLO G & N  
EQUIPMENT TEST  
DATA SHEET 7 OF 7

TEST HISTORY  
DATE START \_\_\_\_\_ END \_\_\_\_\_  
TIME START \_\_\_\_\_ END \_\_\_\_\_  
OPERATOR \_\_\_\_\_ SYSTEM NO. \_\_\_\_\_

JDC  
NO. 12613  
REV. F

JOB LEM G & N SYSTEM POWER SUPPLIES TEST

JDC ITEM NO	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES			MAX VALUE	REJ ACC
				1st	2nd*	3rd*		
32	Line a - line b	volts	0.4				1.0	
33	LGC +14 VDC	volts	13.8				14.2	(c)
37	BIAS 2 voltage	volts						(d)
39	Line c - line d	volts	1.0				5.0	

\* TO BE USED AS REQUIRED OR DESIRED

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10:55 AM '66  
N.W. 9 (20-5)



Rev.	DATE	TORR NO.	PAGES REVISED	APPROVAL	REFERENCES
A	8-16-66	27210	ALL	MIT	NASA
B	8-16-66	27263	7	WK 3	ACM-2
C	4-26-66	28335	3	2, 3, 4, 6, 7	WK 3
D	8-28-66	22349	1, 3	1-6	MM 13
E	8-5-66	30533	1	-	EA 3
F	2-2-67	32888	1, 2	-	EA 3
G	8-31-67	34458	2	2, 4, 6	EA 3
H	12-7-67	35213	1, 3, 4	-	EA 3

IMPORTANT: 1. Those signals listed on the Data Sheets which are started (\*) must be corrected by a multiplication factor to obtain the true value.  
2. Insure the PAVM switch on the Primary Signal Selector panel is set to OFF when the PAVM is not required for voltage measurements.  
3. Insure that cable W228 is removed and connector assembly (2003099) is connected to LGC test connector before proceeding.

CONTROL on the Primary Signal Selector panel to 173.

4. Adjust the G & N POWER ADJUST control on the Test Control panel until the DVM indicates an input bus voltage of 28.0 (+0.25) vdc. Record indication.

5. After the G & N POWER ADJUST OPERATE for 15 minutes, set the Primary Signal Selector panel to monitor the following signals on the DVM and record each voltage.

VOLTAGE	CROSSBAR CONTROL
a. 800 cps 28V 1% supply	121
b. 800 cps 28V 5% supply	199
c. 800 cps 28V 5% supply	199
d. 800 cps 28V 5% supply	199
e. 800 cps 28V 5% supply	199
f. 800 cps 28V 5% supply	199
g. 800 cps 28V 5% supply	199
h. 800 cps 28V 5% supply	199
i. 800 cps 28V 5% supply	199
j. 800 cps 28V 5% supply	199
k. 800 cps 28V 5% supply	199
l. 800 cps 28V 5% supply	199
m. 800 cps 28V 5% supply	199
n. 800 cps 28V 5% supply	199
o. 800 cps 28V 5% supply	199
p. 800 cps 28V 5% supply	199
q. 800 cps 28V 5% supply	199
r. 800 cps 28V 5% supply	199
s. 800 cps 28V 5% supply	199
t. 800 cps 28V 5% supply	199
u. 800 cps 28V 5% supply	199
v. 800 cps 28V 5% supply	199
w. 800 cps 28V 5% supply	199
x. 800 cps 28V 5% supply	199
y. 800 cps 28V 5% supply	199
z. 800 cps 28V 5% supply	199

1. Perform JDC 12613 to establish a Master Initialization condition.  
2. Turn on System in accordance with the applicable turn on procedures.  
3. Connect the input bus to the Digital Voltmeter (DVM) by setting the CROSSBAR VERIFICATION WITH SIGNAL REQUIRED BEFORE USE

DATE 18 JAN 66

VOLTAGE	CROSSBAR CONTROL
d. ECDU +4 VDC	118
e. -28 VDC supply	124
f. PTE (Pulse Torque Electronics) supply 120 VDC output	259
g. X PIPA PVR supply 28 VDC output	195
h. Y PIPA PVR supply 28 VDC output	295
i. Z PIPA PVR supply 28 VDC output	196
j. 3200 cps 28 V feedback (suspension power)	123
k. LGC +4 VDC	194
l. LGC +14.0 VDC	293
m. 28 VDC LGC	193
n. 800 cps Reference Voltage	281
o. 800 cps Reference Voltage	281
p. 800 cps Reference Voltage	281
q. 800 cps Reference Voltage	281
r. 800 cps Reference Voltage	281
s. 800 cps Reference Voltage	281
t. 800 cps Reference Voltage	281
u. 800 cps Reference Voltage	281
v. 800 cps Reference Voltage	281
w. 800 cps Reference Voltage	281
x. 800 cps Reference Voltage	281
y. 800 cps Reference Voltage	281
z. 800 cps Reference Voltage	281

8. Adjust the ATTN D selector switch to the highest attenuation level that will cause triggering. Set the TRIGGER VOLTAGE control to insure that counter starts and subsequently stops in about 10 seconds. The Counter should indicate about 100000.

9. Determine the frequencies of the following signals by setting the COUNTER INPUT "D" SIGNAL selector on the Primary Signal Selector panel and the SAMPLE TIME (N1) setting on the Counter as indicated. Record each reading.

Signal "D" SIGNAL SAMPLE TIME Selector (N1) Setting

a. IMU 28V 800 cps 1 008000

b. 28V 3200 cps 5 032000

c. Feedback (Suspension power)

d. 800 cps Reference Voltage

e. 800 cps Reference Voltage

f. 800 cps Reference Voltage

g. 800 cps Reference Voltage

h. 800 cps Reference Voltage

i. 800 cps Reference Voltage

j. 800 cps Reference Voltage

k. 800 cps Reference Voltage

l. 800 cps Reference Voltage

m. 800 cps Reference Voltage

n. 800 cps Reference Voltage

o. 800 cps Reference Voltage

p. 800 cps Reference Voltage

q. 800 cps Reference Voltage

r. 800 cps Reference Voltage

s. 800 cps Reference Voltage

t. 800 cps Reference Voltage

u. 800 cps Reference Voltage

v. 800 cps Reference Voltage

w. 800 cps Reference Voltage

x. 800 cps Reference Voltage

y. 800 cps Reference Voltage

z. 800 cps Reference Voltage

10. Set the COUNTER INPUT "D" SIGNAL selector on the Primary Signal Selector panel to 15. Place a jumper from PROBES OUTPUT BUFFERED on the Auxiliary Input panel to COUNTER D Pulse In. Change the Counter SAMPLE TIME (N1) setting to 008000. Connect the buffered probe of TPA #2 to TBS plus 37 (HI) and 33 (LO). Record Counter indication.

11. Connect a coax cable between Connector's J1-A and J4-F in the Auxiliary Input panel. Set the Oscilloscope to trigger "B" TIME BASE.

12. Using pulse probe, measure and record the maximum positive pulse amplitude of the 3200 PPS computer synchronization pulses at TBI-6 (HI) and TBI-9 (LO) on TPA #2.

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SIGNAL	CROSSBAR REFERENCE CONTROL	VOLTAGE
a. IMU 28V, 5% PROBE TPA #2	199	800 cps
b. IMU 28V, 5% PROBE TPA #2	199	800 cps
c. IMU 28V, 5% PROBE TPA #2	199	800 cps
d. IMU 28V, 5% PROBE TPA #2	199	800 cps
e. IMU 28V, 5% PROBE TPA #2	199	800 cps
f. IMU 28V, 5% PROBE TPA #2	199	800 cps
g. IMU 28V, 5% PROBE TPA #2	199	800 cps
h. IMU 28V, 5% PROBE TPA #2	199	800 cps
i. IMU 28V, 5% PROBE TPA #2	199	800 cps
j. IMU 28V, 5% PROBE TPA #2	199	800 cps
k. IMU 28V, 5% PROBE TPA #2	199	800 cps
l. IMU 28V, 5% PROBE TPA #2	199	800 cps
m. IMU 28V, 5% PROBE TPA #2	199	800 cps
n. IMU 28V, 5% PROBE TPA #2	199	800 cps
o. IMU 28V, 5% PROBE TPA #2	199	800 cps
p. IMU 28V, 5% PROBE TPA #2	199	800 cps
q. IMU 28V, 5% PROBE TPA #2	199	800 cps
r. IMU 28V, 5% PROBE TPA #2	199	800 cps
s. IMU 28V, 5% PROBE TPA #2	199	800 cps
t. IMU 28V, 5% PROBE TPA #2	199	800 cps
u. IMU 28V, 5% PROBE TPA #2	199	800 cps
v. IMU 28V, 5% PROBE TPA #2	199	800 cps
w. IMU 28V, 5% PROBE TPA #2	199	800 cps
x. IMU 28V, 5% PROBE TPA #2	199	800 cps
y. IMU 28V, 5% PROBE TPA #2	199	800 cps
z. IMU 28V, 5% PROBE TPA #2	199	800 cps

13. Set SCOPE B INPUT 2 selector on OSCILLOGRAPH SIGNAL SELECTOR to 6 and CHANNEL 5 to 7. Insure that CHBAC pushbutton is lighted.

14. Set CH 1 and CH 2 switches on DUAL TRACE AMPLIFIERS OF OSCILLOSCOPE to AC. Set the VOLTS/DIV selector for CH 1 to 2 and CH 2 to 5.

15. Pull out TRIGGER CH 1 ONLY switch on DUAL TRACE AMPLIFIER.

16. Set the TIME BASE "B" controls as follows:

TIME/DIV - .1 m sec

TRIGGER - LOWER BEAM, INT

COUPLING - AC FAST

SLOPE - +

LEVEL - to see trace

B MODE - NORMAL TRIGGER

17. Set switches CH 1 and CH 2 on the OSCILLOSCOPE to GND and position both traces to coincidence. Position the coincidence of sweeps to the center of the scope grid pattern.

18. Set the TIME BASE "B" TIME/DIV control to 50  $\mu$  sec and pull 10X MAG POSITION control. Set CH 1 and CH 2 switches to AC.

19. Measure and record the time difference between the leading edge of the 3200 PPS set pulse and the first positive going zero crossover of the 28V, 3200 cps signal.

20. Measure and record the phase angle of signals listed below on the PAVM by setting the CROSSBAR CONTROL on the

SIGNAL	CROSSBAR REFERENCE CONTROL	VOLTAGE
a. IMU 28V, 5% PROBE TPA #2	199	800 cps
b. IMU 28V, 5% PROBE TPA #2	199	800 cps
c. IMU 28V, 5% PROBE TPA #2	199	800 cps
d. IMU 28V, 5% PROBE TPA #2	199	800 cps
e. IMU 28V, 5% PROBE TPA #2	199	800 cps
f. IMU 28V, 5% PROBE TPA #2	199	800 cps
g. IMU 28V, 5% PROBE TPA #2	199	800 cps
h. IMU 28V, 5% PROBE TPA #2	199	800 cps
i. IMU 28V, 5% PROBE TPA #2	199	800 cps
j. IMU 28V, 5% PROBE TPA #2	199	800 cps
k. IMU 28V, 5% PROBE TPA #2	199	800 cps
l. IMU 28V, 5% PROBE TPA #2	199	800 cps
m. IMU 28V, 5% PROBE TPA #2	199	800 cps
n. IMU 28V, 5% PROBE TPA #2	199	800 cps
o. IMU 28V, 5% PROBE TPA #2	199	800 cps
p. IMU 28V, 5% PROBE TPA #2	199	800 cps
q. IMU 28V, 5% PROBE TPA #2	199	800 cps
r. IMU 28V, 5% PROBE TPA #2	199	800 cps
s. IMU 28V, 5% PROBE TPA #2	199	800 cps
t. IMU 28V, 5% PROBE TPA #2	199	800 cps
u. IMU 28V, 5% PROBE TPA #2	199	800 cps
v. IMU 28V, 5% PROBE TPA #2	199	800 cps
w. IMU 28V, 5% PROBE TPA #2	199	800 cps
x. IMU 28V, 5% PROBE TPA #2	199	800 cps
y. IMU 28V, 5% PROBE TPA #2	199	800 cps
z. IMU 28V, 5% PROBE TPA #2	199	800 cps

30. Set the CROSSBAR CONTROL to 194 and measure the voltage on the DVM. Record the indication.

31. Press the TEST STOP and INTERFACE LOAD TEST pushbuttons. The TEST START and INTERFACE LOAD TEST pushbuttons shall go out.

32. Calculate the LGC +4 VDC voltage change.

LGC +14 VDC-BIAS 2 (ACE)

33. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 293 and measure the voltage on the DVM. Record the indication.

34. Press the INTERFACE LOAD TEST pushbutton on the Test Selector panel. The pushbutton shall light.

35. Set the INTERFACE LOAD SELECTOR to position 8.

36. Press the TEST START pushbutton. The pushbutton shall light.

37. Set the CROSSBAR CONTROL to 293 and measure the voltage on the DVM. Record the indication.

38. Press the TEST STOP and INTERFACE LOAD TEST pushbuttons. The TEST START and INTERFACE LOAD TEST pushbuttons shall go out.

39. Calculate the LGC +14 VDC voltage change.

DATE 18 JAN 66



APOLLO G & N  
EQUIPMENT TEST  
DATA SHEET 1 OF 7

JDC  
NO. 12618  
REV. H  
INITIAL TDRR 213.1

JOB LEM G & N SYSTEM POWER SUPPLIES TEST

ASSEMBLY UNDER TEST		TEST HISTORY	
TITLE	DATE	START	END
SER. NO.	DWG	REV.	SITE/LOCATION
MAJOR GROUND SUPPORT EQUIPMENT			
NAME	SER. NO.	CAL DATE	
NAME	SER. NO.	CAL DATE	
CONDUCTED BY NAME/AFFILIATION			
APPROVED BY NAME/AFFILIATION			

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES			MAX VALUE	REJ ACC
				1st	2nd*	3rd*		
4	Nominal Bus Voltage	volts	27.75				28.25	
5.a	800 cps 28V 1% supply	volts	27.44				28.56	
5.b **	800 cps 28V 5% supply $\phi$ B	volts	25.9				30.1	
5.c **	800 cps 28V 5% supply $\phi$ A	volts	26.6				29.4	
5.d	ECDU +4 VDC	volts	3.8				4.2	
5.e	-28 VDC	volts	-21.5				-33.5	
5.f	PTE supply 120 VDC	volts	114				126	
5.g	X PIPA PVR supply 28 VDC	volts	26.6				29.4	
5.h	Y PIPA PVR supply 28 VDC	volts	26.6				29.4	

\* TO BE USED AS REQUIRED OR DESIRED

DATE 18 JAN 68

APOLLO G & N  
EQUIPMENT TEST  
DATA SHEET 2 OF 7

JDC  
NO. 12618  
REV. H  
TEST HISTORY  
DATE START END  
TIME START END  
OPERATOR SYSTEM NO.

JOB LEM G & N SYSTEM POWER SUPPLIES TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES			MAX VALUE	REJ ACC
				1st	2nd*	3rd*		
5.i	Z PIPA PVR supply 28 VDC	volts	26.6				29.4	
5.j	3200 cps 28V feedback	volts	28.03				29.17	
5.k	LGC +4 VDC	volts	3.85				4.15	
5.l	LGC +14.0 VDC	volts	13.8				14.2	
5.m	28 VDC LGC Operate	volts	26.8				28.2	
5.n	800 cps reference voltage	volts	27.44				28.56	
9.a	IMU 28V 800 cps 1%	counts	099875				100125	
9.b	28V 3200 cps feedback	counts	099968				100032	
10	Counter Indication	counts	099875				100125	
12	3200 pps computer synchronization pulse **	volts	3				10	
19	Time difference	$\mu$ sec	0				9.0	
20.a	IMU 28V 5% 800 cps $\phi$ B	deg	160				200	
20.b	IMU 28V 5% 800 cps $\phi$ A	deg	-100				-80	
21	Phase angle $\phi$ A - $\phi$ B	deg	100				80	

\* TO BE USED AS REQUIRED OR DESIRED

\*\* Correct this measurement using "MULT BY" factor to obtain the true value.

DATE 18 JAN 68

APOLLO G & N  
EQUIPMENT TEST  
DATA SHEET 3 OF 7

JDC  
NO. 12618  
REV. H  
TEST HISTORY  
DATE START END  
TIME START END  
OPERATOR SYSTEM NO.

JOB LEM G & N SYSTEM POWER SUPPLIES TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES			MAX VALUE	REJ ACC
				1st	2nd*	3rd*		
22 (4)	Low Bus Voltage	volts	24.00				24.25	
22 (5.a)	800 cps 28V 1% supply $\phi$ B	volts	27.44				28.56	
22 ** (5.b)	800 cps 28V 5% supply $\phi$ B	volts	25.9				30.1	
22 ** (5.c)	800 cps 28V 5% supply $\phi$ A	volts	26.6				29.4	
22 (5.d)	ECDU +4 VDC	volts	3.8				4.2	
22 (5.e)	-28 VDC	volts	-21.5				-33.5	
22 (5.f)	PTE supply 120 VDC	volts	114				126	
22 (5.g)	X PIPA PVR supply 28 VDC	volts	26.6				29.4	
22 (5.h)	Y PIPA PVR supply 28 VDC	volts	26.6				29.4	
22 (5.i)	Z PIPA PVR supply 28 VDC	volts	26.6				29.4	
22 (5.j)	3200 cps 28V feedback	volts	28.03				29.17	
22 (5.k)	LGC +4 VDC	volts	3.85				4.15	

\* TO BE USED AS REQUIRED OR DESIRED

DATE 18 JAN 68

APOLLO G & N  
EQUIPMENT TEST  
DATA SHEET 4 OF 7

JDC  
NO. 12618  
REV. H  
TEST HISTORY  
DATE START END  
TIME START END  
OPERATOR SYSTEM NO.

JOB LEM G & N SYSTEM POWER SUPPLIES TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES			MAX VALUE	REJ ACC
				1st	2nd*	3rd*		
22 (5.l)	LGC +14.0 VDC	volts	13.8				14.2	
22 (5.m)	28 VDC LGC Operate	volts	26.60				29.40	
22 (5.n)	800 cps reference voltage	volts	26.60				29.40	
22 (9.a) 1%	IMU 28V 800 cps 1%	counts	099875				100125	
22 (9.b)	28V 3200 cps feedback	counts	099968				100032	
22 (10)	Counter Indication	counts	099875				100125	
22 (12)	3200 pps computer synchronization pulse **	volts	3				10	
22 (19)	Time difference	$\mu$ sec	0				9.0	
22 (20.a)	IMU 28V 5% 800 cps $\phi$ B	deg	160				200	
22 (20.b)	IMU 28V 5% 800 cps $\phi$ A	deg	-100				-80	
22 (21)	Phase angle $\phi$ A - $\phi$ B	deg	100				80	
23 (4)	High Bus Voltage	volts	33.25				33.50	

\* TO BE USED AS REQUIRED OR DESIRED

\*\* Correct this measurement using "MULT BY" factor to obtain the true value.

DATE 18 JAN 68







APOLLO G & N  
EQUIPMENT TEST  
DATA SHEET 1 OF 7

JOB LEM G & N SYSTEM POWER SUPPLIES TEST

JDC  
NO. 12618  
REV. J  
INITIAL TDOR 25311

ASSEMBLY UNDER TEST		TEST HISTORY	
TITLE	DATE	START	END
SER. NO.	DWG	REV.	SITE / LOCATION
MAJOR GROUND SUPPORT EQUIPMENT		TIME	END
		START	TOTAL ELAPSED
NAME	SER. NO.	CAL. DATE	
NAME	SER. NO.	CAL. DATE	
CONDUCTED BY		APPROVED BY	
NAME/AFFILIATION		NAME/AFFILIATION	

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES	MAX VALUE	REJ ACC
				1st	2nd*	3rd*
4	Nominal Bus Voltage	volts	27.75			28.25
5.a	800 cps 28V 1%	volts	27.44			28.56
5.b **	800 cps 28V 5% supply $\phi$ B	volts	25.9			30.1
5.c **	800 cps 28V 5% supply $\phi$ A	volts	26.6			29.4
5.d	ECDU +4 VDC	volts	3.8			4.2
5.e	-28 VDC	volts	-31.5			-33.5
5.f	PTE supply 120 VDC	volts	114			126
5.g	X PIPA PVR supply 28 VDC	volts	26.6			29.4
5.h	Y PIPA PVR supply 28 VDC	volts	26.6			29.4

\* TO BE USED AS REQUIRED OR DESIRED

DATE 18 JAN 68

APOLLO G & N  
EQUIPMENT TEST  
DATA SHEET 2 OF 7

JOB LEM G & N SYSTEM POWER SUPPLIES TEST

TEST HISTORY	
DATE	START
TIME	START
OPERATOR	END
	SYSTEM NO.

JDC  
NO. 12618  
REV. J

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES	MAX VALUE	REJ ACC
				1st	2nd*	3rd*
5.i	Z PIPA PVR supply 28 VDC	volts	26.6			29.4
5.j	3200 cps 28V feedback	volts	26.03			29.17
5.k	LGC +4 VDC	volts	3.85			4.15
5.l	LGC +14.0 VDC	volts	13.8			14.2
5.m	28 VDC LGC Operate	volts	26.8			28.2
5.n	800 cps reference voltage	volts	27.44			28.56
9.a	IMU 28V 800 cps 1%	counts	099875			100125
9.b	28V 3200 cps feedback	counts	099968			100032
10	Counter indication	counts	099875			100125
12	3200 pps computer synchronization pulse **	volts	3			10
19	Time difference	$\mu$ sec	0			9.0
20.a	IMU 28V 5% 800 cps $\phi$ B	deg	160			200
20.b	IMU 28V 5% 800 cps $\phi$ A	deg	-100			-80
21	Phase angle $\phi$ A - $\phi$ B	deg	100			80

\* TO BE USED AS REQUIRED OR DESIRED  
\*\* Correct this measurement using "MULT BY" factor to obtain the true value.

DATE 18 JAN 68  
FORM 00130  
(Rev. 7-25-65)

APOLLO G & N  
EQUIPMENT TEST  
DATA SHEET 3 OF 7

JOB LEM G & N SYSTEM POWER SUPPLIES TEST

TEST HISTORY	
DATE	START
TIME	START
OPERATOR	END
	SYSTEM NO.

JDC  
NO. 12618  
REV. J

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES	MAX VALUE	REJ ACC
				1st	2nd*	3rd*
22 (4)	Low Bus Voltage	volts	24.25			24.50
22 (5.a)	800 cps 28V 1%	volts	27.44			28.56
22 ** (5.b)	800 cps 28V 5% supply $\phi$ B	volts	25.9			30.1
22 ** (5.c)	800 cps 28V 5% supply $\phi$ A	volts	26.6			29.4
22 (5.d)	ECDU +4 VDC	volts	3.8			4.2
22 (5.e)	-28 VDC	volts	-21.5			-33.5
22 (5.f)	PTE supply 120 VDC	volts	114			126
22 (5.g)	X PIPA PVR supply 28 VDC	volts	26.6			29.4
22 (5.h)	Y PIPA PVR supply 28 VDC	volts	26.6			29.4
22 (5.i)	Z PIPA PVR supply 28 VDC	volts	26.6			29.4
22 (5.j)	3200 cps 28V feedback	volts	26.03			29.17
22 (5.k)	LGC +4 VDC	volts	3.85			4.15

\* TO BE USED AS REQUIRED OR DESIRED

DATE 18 JAN 68  
FORM 00130  
(Rev. 7-25-65)

APOLLO G & N  
EQUIPMENT TEST  
DATA SHEET 4 OF 7

JOB LEM G & N SYSTEM POWER SUPPLIES TEST

TEST HISTORY	
DATE	START
TIME	START
OPERATOR	END
	SYSTEM NO.

JDC  
NO. 12618  
REV. J

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES	MAX VALUE	REJ ACC
				1st	2nd*	3rd*
22 (5.l)	LGC +14.0 VDC	volts	13.8			14.2
22 (5.m)	28 VDC LGC Operate	volts				
22 (5.n)	800 cps reference voltage	volts	26.80			29.40
22 (9.a) 1%	IMU 28V 800 cps	counts	099875			100125
22 (9.b)	28V 3200 cps feedback	counts	099968			100032
22 (10)	Counter indication	counts	099875			100125
22 (12)	3200 pps computer synchronization pulse **	volts	3			10
22 (19)	Time difference	$\mu$ sec	0			9.0
22 (20.a)	IMU 28V 5% 800 cps $\phi$ B	deg	160			200
22 (20.b)	IMU 28V 5% 800 cps $\phi$ A	deg	-100			-80
22 (21)	Phase angle $\phi$ A - $\phi$ B	deg	100			80
23 (4)	High Bus Voltage	volts	33.50			33.75

\* TO BE USED AS REQUIRED OR DESIRED  
\*\* Correct this measurement using "MULT BY" factor to obtain the true value.

DATE 18 JAN 68  
FORM 00130  
(Rev. 7-25-65)



APOLLO G & N  
EQUIPMENT TEST  
DATA SHEET 5 OF 7

TEST HISTORY  
DATE START TIME START OPERATOR  
END END  
REFERENCE

JDC  
NO. 12618  
REV. J

JOB LEM G & N SYSTEM POWER SUPPLIES TEST

JDC ITEM NO	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES	MAX VALUE	REJ ACC
				1st 2nd* 3rd*		
28 (5.a)	800 cps 28V 1%	volts	27.44		28.56	
23** (5.b)	800 cps 28V 5% supply $\phi$ B	volts	25.9		30.1	
23** (5.c)	800 cps 28V 5% supply $\phi$ A	volts	26.6		29.4	
23 (5.d)	ECDU +4 VDC	volts	3.8		4.2	
23 (5.e)	-28 VDC	volts	-21.5		-33.5	
23 (5.f)	PTE supply 120 VDC	volts	114		126	
23 (5.g)	X PIPA PVR supply 28 VDC	volts	26.6		29.4	
23 (5.h)	Y PIPA PVR supply 28 VDC	volts	26.6		29.4	
23 (5.i)	Z PIPA PVR supply 28 VDC	volts	26.6		29.4	
23 (5.j)	3200 cps 28V feedback	volts	28.03		29.17	
23 (5.k)	LGC +4 VDC	volts	3.85		4.15	
23 (5.l)	LGC +14.0 VDC	volts	13.8		14.2	

\* TO BE USED AS REQUIRED OR DESIRED

DATE 18 JAN 68  
FORM 0 154  
NEW 5-3-66

APOLLO G & N  
EQUIPMENT TEST  
DATA SHEET 6 OF 7

TEST HISTORY  
DATE START TIME START OPERATOR  
END END  
REFERENCE

JDC  
NO. 12618  
REV. J

JOB LEM G & N SYSTEM POWER SUPPLIES TEST

JDC ITEM NO	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES	MAX VALUE	REJ ACC
				1st 2nd* 3rd*		
23 (5.m)	28 VDC LGC Operate	volts				
23 (5.n)	800 cps reference voltage	volts	26.80		29.40	
23 (9.a)	IMU 28V 800 cps 1%	counts	098675		100125	
23 (9.b)	28V 3200 cps feedback	counts	098968		100032	
23 (10)	Counter indication	counts	098875		100125	
23 (12)	3200 cps computer synchronization pulse**	volts	3		10	
23 (19)	Time difference	$\mu$ sec	0		9.0	
23 (20.a)	IMU 28V 5% 800 cps $\phi$ B	deg	160		200	
23 (20.b)	IMU 28V 5% 800 cps $\phi$ A	deg	-100		-80	
23 (21)	Phase angle $\phi$ A - $\phi$ B	deg	100		80	
25	Nominal Bus Voltage	volts	27.75		28.25	
26	LGC +4 VDC	volts	3.85		4.15	
30	BIAS 1 voltage	volts				

\* TO BE USED AS REQUIRED OR DESIRED  
\*\* Correct this measurement using "MULT BY" factor  
to obtain the true value.

DATE 18 JAN 68  
FORM 001 11  
NEW 5-3-66

APOLLO G & N  
EQUIPMENT TEST  
DATA SHEET 7 OF 7

TEST HISTORY  
DATE START TIME START OPERATOR  
END END  
REFERENCE

JDC  
NO. 12618  
REV. J

JOB LEM G & N SYSTEM POWER SUPPLIES TEST

JDC ITEM NO	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES	MAX VALUE	REJ ACC
				1st 2nd* 3rd*		
32	Line a - line b	volts	0.4		1.0	
33	LGC +14 VDC	volts	13.8		14.2	
37	BIAS 2 voltage	volts				
39	Line c - line d	volts	1.0		5.0	

\* TO BE USED AS REQUIRED OR DESIRED

DATE 18 JAN 68  
FORM 0 154  
NEW 5-3-66

Rev. Let.	Date	TORR NO.	PAGES REVISED	APPROVAL	REFERENCES
A	8-16-68	27210	ALL	MIT NASA	PS 6015000
B	8-16-68	27283	-	WK-21 ACM-4	
C	4-28-68	28335	3	2,3,4,6,7 WK-25	IMPORTANT
D	8-28-68	29849	1,3	1-6 MM-15	See Below:
E	8-5-68	30533	1	-	EA-2
F	2-2-67	32988	1,2	-	EA-2
G	8-31-67	34458	2	2,4,6	EA-2
H	12-7-67	35213	1,3,4	-	EA-2
I	2-6-68	35560	-	3,4	EA-2
K	1-28-69	37274	1,3	2-6	EA-2

IMPORTANT: 1. Those signals listed on the Data Sheets which are starred (\*\*) must be corrected by a multiplication factor to obtain the true value.  
2. Insure the PAVM switch on the Primary Signal Selector panel is set to OFF when the PAVM is not required for voltage measurements.  
3. Insure that cable W226 is removed and connector assembly (2003099) is connected to LGC test connector before proceeding.

NOMINAL BUS VOLTAGE  
1. Perform JDC 12613 to establish a Master Initialization condition.  
2. Turn on System in accordance with the applicable turn on procedures.  
3. Connect the input bus to the Digital Voltmeter (DVM) by setting the CROSSBAR VERIFICATION WITH SIGNAL REQUIRED BEFORE USE  
DATE 18 JAN 68

CONTROL on the Primary Signal Selector panel to 173.  
4. Adjust the G & N POWER ADJUST control on the Test Control panel until the DVM indicates an input bus voltage of 28.0 (±0.25) vdc. Record indication.  
5. After the G & N SYSTEM has been in OPERATE for 15 minutes, set the Primary Signal Selector panel to monitor the following signals on the DVM and record each voltage.  
VOLTAGE CROSSBAR CONTROL  
a. 800 cps 28V 1% supply 121  
b. 800 cps 28V 5% supply 199  
c. 800 cps 28V 5% supply PROBE TPA #2 TB5-28 (hi) TB5-33 (lo) 199  
d. 800 cps 28V 5% supply PROBE TPA #2 TB5-37 (hi) TB5-33 (lo) 199

VOLTAGE CROSSBAR CONTROL  
d. ECDU +4 VDC 118  
e. -28 VDC supply 124  
f. PTE (Pulse Torque Eleo- tronic) supply 120 VDC output 259  
g. X PIPA PVR supply 28 VDC output 195  
h. Y PIPA PVR supply 28 VDC output 295  
i. Z PIPA PVR supply 28 VDC output 196  
j. 3200 cps 28 V feedback (Suspension power) 123  
k. LGC +4 VDC 194  
l. LGC +14.0 VDC 293  
m. 28 VDC LGC Operate 193  
n. 800 cps Reference Voltage 281  
6. Set switches and controls on the Counter as follows:  
DISPLAY TIME (N<sub>2</sub>) switch to 10<sup>5</sup>  
DISPLAY RESET switch to ZERO  
CLOCK FREQUENCY DIVIDER switch to 10  
CLOCK SELECTOR to INTERNAL  
INPUT SELECTOR switch to C SENSE  
SENSE SELECTOR to FWD  
ATTEN to 10  
TRIGGER VOLTAGE fully ccw  
SAMPLE TIME (N<sub>1</sub>) to 008000  
FUNCTION switch to RATIO OR PERIOD  
7. Set COUNTER INPUT "P" SIGNAL selector on the Primary Signal Selector panel to 1.  
Signal "D" SIGNAL SAMPLE TIME Selector (N<sub>1</sub>) Setting  
a. IMU 28V 800 cps 1% 008000  
b. 28V 3200 cps 5 Feedback (Suspension power) 032000  
10. Set the COUNTER INPUT "D" SIGNAL selector on the Primary Signal Selector panel to 15. Place a jumper from PROBES OUTPUT BUFFERED on the Auxiliary Input panel to COUNTER D Pulse In. Change the Counter SAMPLE TIME (N<sub>1</sub>) setting to 008000. Connect the buffered probe of TPA #2 to TB5 pins 37 (HI) and 33 (LO). Record Counter indication.  
11. Connect a coax cable between Connectors J1-A and J4-F in the Auxiliary Input panel.  
12. Using pulse probe, measure and record the maximum positive pulse amplitude of the 3200 PPS computer synchronization pulses at TB1-6 (HI) and TB1-9 (LO) on TPA #2.  
DATE 18 JAN 68

Primary Signal Selector panel as indicated.  
SIGNAL CROSSBAR REFERENCE VOLTAGE  
a. IMU 28V, 5% PROBE TPA #2 800 cps  
800 cps # B TB5-28 (hi) TB5-33 (lo)  
b. IMU 28V, 5% PROBE TPA #2 800 cps  
800 cps # A TB5-37 (hi) TB5-33 (lo)  
21. Calculate phase angle between 20.a and 20.b.  
LOW BUS VOLTAGE  
22. Repeat steps 3 through 21 adjusting for 24.50 (+0.25, -0) vdc in step 4.  
HIGH BUS VOLTAGE  
23. Repeat steps 3 through 21 adjusting for 33.50 (+0, -0.25) vdc in step 4.  
NORMALIZATION OF SYSTEM  
24. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 173.  
25. Adjust the G & N POWER ADJUST control on the Test Control panel until the DVM indicates an input bus voltage of 28.0 (±0.25) vdc. Record indication.  
LGC +4VDC-BIAS 1 (ACE)  
26. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 194 and measure the voltage on the DVM. Record the indication.  
27. Press the INTERFACE LOAD TEST pushbutton on the Test Selector panel. The pushbutton shall light.  
28. Set the INTERFACE LOAD SELECTOR to position 7.  
29. Press the TEST START pushbutton. The pushbutton shall light.

30. Set the CROSSBAR CONTROL to 194 and measure the voltage on the DVM. Record the indication.  
31. Press the TEST STOP and INTERFACE LOAD TEST pushbuttons. The TEST START and INTERFACE LOAD TEST pushbuttons shall go out.  
32. Calculate the LGC +4 VDC voltage change.  
LGC +14 VDC-BIAS 2 (ACE)  
33. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 293 and measure the voltage on the DVM. Record the indication.  
34. Press the INTERFACE LOAD TEST pushbutton on the Test Selector panel. The pushbutton shall light.  
35. Set the INTERFACE LOAD SELECTOR to position 8.  
36. Press the TEST START pushbutton. The pushbutton shall light.  
37. Set the CROSSBAR CONTROL to 293 and measure the voltage on the DVM. Record the indication.  
38. Press the TEST STOP and INTERFACE LOAD TEST pushbuttons. The TEST START and INTERFACE LOAD TEST pushbuttons shall go out.  
39. Calculate the LGC +14 VDC voltage change.

APOLLO G & N  
EQUIPMENT TEST  
DATA SHEET 1 OF 7

JDC  
NO. 12618  
REV. K  
INITIAL TDRR 2531

JOB LEM G & N SYSTEM POWER SUPPLIES TEST

ASSEMBLY UNDER TEST		TEST HISTORY	
TITLE	DATE	START	END
SER. NO.	DWG	REV.	SITE / LOCATION
MAJOR GROUND SUPPORT EQUIPMENT			
NAME	SER. NO.	CAL DATE	
NAME	SER. NO.	CAL DATE	

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES			MAX VALUE	REJ ACC
				1st	2nd*	3rd*		
4	Nominal Bus Voltage	volts	27.75				28.25	
5.a	800 cps 28V 1%	volts	27.44				28.56	
5.b **	800 cps 28V 5% supply $\phi$ B	volts	25.9				30.1	
5.c **	800 cps 28V 5% supply $\phi$ A	volts	26.6				29.4	
5.d	ECDU +4 VDC	volts	3.8				4.2	
5.e	-28 VDC	volts	-21.5				-33.5	
5.f	PTE supply 120 VDC	volts	114				126	
5.g	X PIPA PVR supply 28 VDC	volts	26.6				29.4	
5.h	Y PIPA PVR supply 28 VDC	volts	26.6				29.4	

\* TO BE USED AS REQUIRED OR DESIRED

DATE 18 JAN 68

APOLLO G & N  
EQUIPMENT TEST  
DATA SHEET 2 OF 7

JDC  
NO. 12618  
REV. K

JOB LEM G & N SYSTEM POWER SUPPLIES TEST

JDC ITEM NO	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES			MAX VALUE	REJ ACC
				1st	2nd*	3rd*		
5.i	Z PIPA PVR supply 28 VDC	volts	26.6				29.4	
5.j	3200 cps 28V feedback	volts	28.04				29.16	
5.k	LGC +4 VDC	volts	3.8				4.2	
5.l	LGC +14.0 VDC	volts	13.6				14.4	
5.m	28 VDC LGC Operate	volts	24.5				33.5	
5.n	800 cps reference voltage	volts	27.44				28.56	
9.a	IMU 28V 800 cps 1%	counts	099875				100125	
9.b	28V 3200 cps feedback	counts	099968				100032	
10	Counter indication	counts	099875				100125	
12	3200 pps computer synchronization pulse **	volts	3				10	
19	Time difference	$\mu$ sec	0				9.0	
20.a	IMU 28V 5% 800 cps $\phi$ B	deg	160				200	
20.b	IMU 28V 5% 800 cps $\phi$ A	deg	-80				-100	
21	Phase angle $\phi$ A - $\phi$ B	deg	80				100	

\* TO BE USED AS REQUIRED OR DESIRED

\*\* Correct this measurement using "MULT BY" factor to obtain the true value.

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Chg. 1-2-68

APOLLO G & N  
EQUIPMENT TEST  
DATA SHEET 3 OF 7

JDC  
NO. 12618  
REV. K

TEST HISTORY  
DATE START  
TIME START  
OPERATOR

JOB LEM G & N SYSTEM POWER SUPPLIES TEST

JDC ITEM NO	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES			MAX VALUE	REJ ACC
				1st	2nd*	3rd*		
22 (4)	Low Bus Voltage	volts	24.50				24.75	
22 (5.a)	800 cps 28V 1%	volts	27.44				28.56	
22 ** (5.b)	800 cps 28V 5% supply $\phi$ B	volts	25.9				30.1	
22 ** (5.c)	800 cps 28V 5% supply $\phi$ A	volts	26.6				29.4	
22 (5.d)	ECDU +4 VDC	volts	3.8				4.2	
22 (5.e)	-28 VDC	volts	-21.5				-33.5	
22 (5.f)	PTE supply 120 VDC	volts	114				126	
22 (5.g)	X PIPA PVR supply 28 VDC	volts	26.6				29.4	
22 (5.h)	Y PIPA PVR supply 28 VDC	volts	26.6				29.4	
22 (5.i)	Z PIPA PVR supply 28 VDC	volts	26.6				29.4	
22 (5.j)	3200 cps 28V feedback	volts	28.04				29.16	
22 (5.k)	LGC +4 VDC	volts	3.8				4.2	

\* TO BE USED AS REQUIRED OR DESIRED

DATE 18 JAN 68

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APOLLO G & N  
EQUIPMENT TEST  
DATA SHEET 4 OF 7

JDC  
NO. 12618  
REV. K

TEST HISTORY  
DATE START  
TIME START  
OPERATOR

JOB LEM G & N SYSTEM POWER SUPPLIES TEST

JDC ITEM NO	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES			MAX VALUE	REJ ACC
				1st	2nd*	3rd*		
22 (5.l)	LGC +14.0 VDC	volts	13.6				14.4	
22 (5.m)	28 VDC LGC Operate	volts						
22 (5.n)	800 cps reference voltage	volts	26.60				29.40	
22 (9.a)	IMU 28V 800 cps 1%	counts	099875				100125	
22 (9.b)	28V 3200 cps feedback	counts	099968				100032	
22 (10)	Counter indication	counts	099875				100125	
22 (12)	3200 pps computer synchronization pulse **	volts	3				10	
22 (19)	Time difference	$\mu$ sec	0				9.0	
22 (20.a)	IMU 28V 5% 800 cps $\phi$ B	deg	160				200	
22 (20.b)	IMU 28V 5% 800 cps $\phi$ A	deg	-80				-100	
22 (21)	Phase angle $\phi$ A - $\phi$ B	deg	80				100	
23 (4)	High Bus Voltage	volts	33.25				33.50	

\* TO BE USED AS REQUIRED OR DESIRED

\*\* Correct this measurement using "MULT BY" factor to obtain the true value.

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APOLLO G & N  
EQUIPMENT TEST  
DATA SHEET 5 OF 7

TEST HISTORY  
DATE START \_\_\_\_\_ END \_\_\_\_\_  
TIME START \_\_\_\_\_ END \_\_\_\_\_  
OPERATOR \_\_\_\_\_ SYSTEM NO. \_\_\_\_\_

JDC  
NO. 12618  
REV. K

JOB LEM G & N SYSTEM POWER SUPPLIES TEST

JDC ITEM NO	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES	MAX VALUE	REJ ACC
				1st 2nd* 3rd*		
23 (5.a)	800 cps 28V 1%	volts	27.44		28.56	
23 ** (5.b)	800 cps 28V 5% supply $\phi$ B	volts	25.9		30.1	
23 ** (5.c)	800 cps 28V 5% supply $\phi$ A	volts	26.6		29.4	
23 (5.d)	ECDU +4 VDC	volts	3.8		4.2	
23 (5.e)	-28 VDC	volts	-21.5		-33.5	
23 (5.f)	PTE supply 120 VDC	volts	114		126	
23 (5.g)	X PIPA PVR supply 28 VDC	volts	26.6		29.4	
23 (5.h)	Y PIPA PVR supply 28 VDC	volts	26.6		29.4	
23 (5.i)	Z PIPA PVR supply 28 VDC	volts	26.6		29.4	
23 (5.j)	3200 cps 28V feedback	volts	28.04		29.16	
23 (5.k)	LGC +4 VDC	volts	3.8		4.2	
23 (5.l)	LGC +14.0 VDC	volts	13.6		14.4	

\* TO BE USED AS REQUIRED OR DESIRED

DATE 18 JAN 66  
FOR 4 0014  
NEW 4-10-65

APOLLO G & N  
EQUIPMENT TEST  
DATA SHEET 6 OF 7

TEST HISTORY  
DATE START \_\_\_\_\_ END \_\_\_\_\_  
TIME START \_\_\_\_\_ END \_\_\_\_\_  
OPERATOR \_\_\_\_\_ SYSTEM NO. \_\_\_\_\_

JDC  
NO. 12618  
REV. K

JOB LEM G & N SYSTEM POWER SUPPLIES TEST

JDC ITEM NO	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES	MAX VALUE	REJ ACC
				1st 2nd* 3rd*		
23 (5.m)	28 VDC LGC Operate	volts				
23 (5.n)	800 cps reference voltage	volts	26.60		29.40	
23 (9.a)	IMU 28V 800 cps 1%	counts	099875		100125	
23 (9.b)	28V 3200 cps feedback	counts	099868		100032	
23 (10)	Counter indication	counts	099875		100125	
23 (12)	3200 pps computer synchronization pulse **	volts	3		10	
23 (19)	Time difference	$\mu$ sec	0		9.0	
23 (20.a)	IMU 28V 5% 800 cps $\phi$ B	deg.	160		200	
23 (20.b)	IMU 28V 5% 800 cps $\phi$ A	deg	-80		-100	
23 (21)	Phase angle $\phi$ A - $\phi$ B	deg	80		100	
25	Nominal Bus Voltage	volts	27.75		28.25	
26	LGC +4 VDC	volts	3.85		4.15	
30	BIAS 1 voltage	volts				

\* TO BE USED AS REQUIRED OR DESIRED

\*\* Correct this measurement using "MULT BY" factor  
to obtain the true value.

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FOR 4 0014  
NEW 4-10-65

APOLLO G & N  
EQUIPMENT TEST  
DATA SHEET 7 OF 7

TEST HISTORY  
DATE START \_\_\_\_\_ END \_\_\_\_\_  
TIME START \_\_\_\_\_ END \_\_\_\_\_  
OPERATOR \_\_\_\_\_ SYSTEM NO. \_\_\_\_\_

JDC  
NO. 12618  
REV. K

JOB LEM G & N SYSTEM POWER SUPPLIES TEST

JDC ITEM NO	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES	MAX VALUE	REJ ACC
				1st 2nd* 3rd*		
32	Line a - line b	volts	0.4		1.0	
33	LGC +14 VDC	volts	13.8		14.2	
37	BIAS 2 voltage	volts				
38	Line c - line d	volts	1.0		5.0	

\* TO BE USED AS REQUIRED OR DESIRED

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FOR 4 0014  
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APOLLO G & N  
EQUIPMENT TEST

DATA SHEET 1 OF 7

JDC  
NO. 12618  
REV. \_\_\_\_\_  
INITIAL TDR 25341

JOB LEM G & N SYSTEM POWER SUPPLIES TEST

ASSEMBLY UNDER TEST				TEST HISTORY			
TITLE	DATE	START	END	DATE	START	END	SITE / LOCATION
SER. NO. _____	DWG. _____	REV. _____		TIME	START	END	TOTAL ELAPSED
MAJOR GROUND SUPPORT EQUIPMENT							
NAME _____	SER. NO. _____	SER. NO. _____	SER. NO. _____	CAL DATE			
NAME _____	SER. NO. _____	SER. NO. _____	SER. NO. _____	CAL DATE			
CONDUCTED BY _____ NAME/AFFILIATION _____				APPROVED BY _____ NAME/AFFILIATION _____			

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES			MAX VALUE	REJ ACC
				1st	2nd*	3rd*		
4	Nominal Bus Voltage	volts	27.75				28.25	
5.a	800 cps 28V 1%	volts	27.44				28.56	
5.b	800 cps 28V 5% supply 0° $\phi$ A	volts	25.2				30.8	
5.c	800 cps 28V 5% supply 90° $\phi$ B	volts	26.6				29.4	
5.d	ECDU +4 VDC	volts	3.8				4.2	
5.e	-28 VDC	volts	-21.5				-33.5	
5.f	PTE supply 120 VDC	volts	114				126	
5.g	X PIPA PVR supply 28 VDC	volts	26.6				29.4	
5.h	Y PIPA PVR supply 28 VDC	volts	26.6				29.4	

\* TO BE USED AS REQUIRED OR DESIRED

DATE \_\_\_\_\_

APOLLO G & N  
EQUIPMENT TEST

DATA SHEET 2 OF 7

JDC  
NO. 12618  
REV. \_\_\_\_\_

JOB LEM G & N SYSTEM POWER SUPPLIES TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES			MAX VALUE	REJ ACC
				1st	2nd*	3rd*		
5.i	Z PIPA PVR supply 28 VDC	volts	26.6				29.4	
5.j	3200 cps 28V feedback	volts	27.44				28.56	
5.k	9 LGC +4 VDC	volts	3.85				4.15	
5.l	LGC +14.0 VDC	volts	13.8				14.2	
5.m	Regulated 28 VDC LGC Operate	volts	26.8				28.2	
5.n	800 cps reference voltage	volts	26.60				29.40	
9.a	IMU 28V 800 cps 1%	counts	099875				100125	
9.b	28V 3200 cps feedback	counts	099968				100032	
10	Counter Indication	counts	099875				100125	
12	3200 pps	volts p-p	3				10	
19	Time difference	sec	0				9.0	
20.a	IMU 28V 5% 800 cps $\phi$ B	deg						
20.b	IMU 28V 5% 800 cps $\phi$ A	deg	-100				-80	
21	Phase angle $\phi$ A - $\phi$ B	deg	100				80	

\* TO BE USED AS REQUIRED OR DESIRED

DATE \_\_\_\_\_

APOLLO G & N  
EQUIPMENT TEST

DATA SHEET 3 OF 7

JDC  
NO. 12618  
REV. \_\_\_\_\_

TEST HISTORY			
DATE	START	END	SYSTEM NO.
TIME	START	END	
OPERATOR			

JOB LEM G & N SYSTEM POWER SUPPLIES TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES			MAX VALUE	REJ ACC
				1st	2nd*	3rd*		
22 (4)	Low Bus Voltage	volts	24.25				23.75	
22 (5.a)	800 cps 28V 1%	volts	27.44				28.25	
22 (5.b)	800 cps 28V 5% supply 0° $\phi$ A	volts	25.2				30.8	
22 (5.c)	800 cps 28V 5% supply 90° $\phi$ B	volts	26.6				29.4	
22 (5.d)	ECDU +4 VDC	volts	3.8				4.2	
22 (5.e)	-28 VDC	volts	-21.5				-33.5	
22 (5.f)	PTE supply 120 VDC	volts	114				126	
22 (5.g)	X PIPA PVR supply 28 VDC	volts	26.6				29.4	
22 (5.h)	Y PIPA PVR supply 28 VDC	volts	26.6				29.4	
22 (5.i)	Z PIPA PVR supply 28 VDC	volts	26.6				29.4	
22 (5.j)	3200 cps 28V feedback	volts	27.44				28.56	
22 (5.k)	LGC +4 VDC	volts	3.85				4.15	

\* TO BE USED AS REQUIRED OR DESIRED

DATE \_\_\_\_\_

APOLLO G & N  
EQUIPMENT TEST

DATA SHEET 4 OF 7

JDC  
NO. 12618  
REV. \_\_\_\_\_

TEST HISTORY			
DATE	START	END	SYSTEM NO.
TIME <td>START <td>END <td></td> </td></td>	START <td>END <td></td> </td>	END <td></td>	
OPERATOR			

JOB LEM G & N SYSTEM POWER SUPPLIES TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES			MAX VALUE	REJ ACC
				1st	2nd*	3rd*		
22 (5.l)	LGC +14.0 VDC	volts	13.8				14.2	
22 (5.m)	Regulated 28 VDC LGC operate	volts	27.8				28.2	
22 (5.n)	800 cps reference voltage	volts	27.44				28.56	
22 (9.a)	IMU 28V 800 cps 1%	counts	099875				100125	
22 (9.b)	28V 3200 cps feedback	counts	099968				100032	
22 (10)	Counter Indication	counts	099875				100125	
22 (12)	3200 pps	volts p-p	3				10	
22 (19)	Time difference	sec	0				9.0	
22 (20.a)	IMU 28V 5% 800 cps $\phi$ B	deg						
22 (20.b)	IMU 28V 5% 800 cps $\phi$ A	deg	-100				-80	
22 (21)	Phase angle $\phi$ A - $\phi$ B	deg	100				80	
23 (4)	High Bus Voltage	volts	32.25				32.75	

\* TO BE USED AS REQUIRED OR DESIRED

DATE \_\_\_\_\_

APOLLO G & N  
EQUIPMENT TEST  
DATA SHEET 5 OF 7

TEST HISTORY  
DATE START \_\_\_\_\_ END \_\_\_\_\_  
TIME START \_\_\_\_\_ END \_\_\_\_\_  
OPERATOR \_\_\_\_\_ SYSTEM NO. \_\_\_\_\_

JDC  
NO. 12618  
REV. \_\_\_\_\_

JOB LEM G & N SYSTEM POWER SUPPLIES TEST

JDC ITEM NO	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES	MAX VALUE	REJ ACC
				1st 2nd* 3rd*		
23 (5.a)	800 cps 28V 1%	volts	27.44		28.25	
23 (5.b)	800 cps 28V 5% supply 0° $\phi$ A	volts	25.2		30.8	
23 (5.c)	800 cps 28V 5% supply 90° $\phi$ B	volts	26.6		29.4	
23 (5.d)	ECDU +4 VDC	volts	3.8		4.2	
23 (5.e)	-28 VDC	volts	-21.5		-33.5	
23 (5.f)	PTE supply 120 VDC	volts	114		126	
23 (5.g)	X PIPA PVR supply 28 VDC	volts	26.6		29.4	
23 (5.h)	Y PIPA PVR supply 28 VDC	volts	26.6		29.4	
23 (5.i)	Z PIPA PVR supply 28 VDC	volts	26.6		29.4	
23 (5.j)	3200 cps 28V feedback	volts	27.44		28.66	
23 (5.k)	LGC +4 VDC	volts	3.85		4.15	
23 (5.l)	LGC +14.0 VDC	volts	13.8		14.2	

\* TO BE USED AS REQUIRED OR DESIRED

DATE \_\_\_\_\_

APOLLO G & N  
EQUIPMENT TEST  
DATA SHEET 6 OF 7

TEST HISTORY  
DATE START \_\_\_\_\_ END \_\_\_\_\_  
TIME START \_\_\_\_\_ END \_\_\_\_\_  
OPERATOR \_\_\_\_\_ SYSTEM NO. \_\_\_\_\_

JDC  
NO. 12618  
REV. \_\_\_\_\_

JOB LEM G & N SYSTEM POWER SUPPLIES TEST

JDC ITEM NO	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES	MAX VALUE	REJ ACC
				1st 2nd* 3rd*		
23	Regulated 28 VDC	volts	27.8		28.2	
23 (5.m)	LGC operate	volts	27.44		28.56	
23 (5.n)	800 cps reference voltage	counts	099875		100125	
23 (9.a)	IMU 28V 800 cps 1%	counts	099868		100032	
23 (9.b)	28V 3200 cps feedback	counts	099875		100125	
23 (10)	Counter indication	counts	3		10	
23 (12)	3200 pps	p-p	0		9.0	
23 (19)	Time difference	deg				
23 (20.a)	IMU 28V 5% 800 cps $\phi$ B	deg				
23 (20.b)	IMU 28V 5% 800 cps $\phi$ A	deg	-100		-80	
23 (21)	Phase angle $\phi$ A - $\phi$ B	deg	100		80	
25	Nominal Bus Voltage	volts	27.75		28.25	
26	LGC +4 VDC	volts	3.85		4.15	
30	CONTROL 1 voltage	volts				

\* TO BE USED AS REQUIRED OR DESIRED

DATE \_\_\_\_\_

APOLLO G & N  
EQUIPMENT TEST  
DATA SHEET 7 OF 7

TEST HISTORY  
DATE START \_\_\_\_\_ END \_\_\_\_\_  
TIME START \_\_\_\_\_ END \_\_\_\_\_  
OPERATOR \_\_\_\_\_ SYSTEM NO. \_\_\_\_\_

JDC  
NO. 12618  
REV. \_\_\_\_\_

JOB LEM G & N SYSTEM POWER SUPPLIES TEST

JDC ITEM NO	PARAMETER	UNITS	MIN VALUE	RECORDED VALUES	MAX VALUE	REJ ACC
				1st 2nd* 3rd*		
32	Line a - line b	volts	0.20		0.4	
33	LGC +14 VDC	volts	13.8		14.2	
37	CONTROL 2 voltage	volts				
38	Line c - line d	volts	0.80		1.0	

\* TO BE USED AS REQUIRED OR DESIRED

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JOB GIMBAL RESPONSE TEST			JDC 12619 REV A PAGE 5 OF 10
SUBSYSTEM	LEM G & N SYSTEM	ASSY	
c. +00000	ENTR	maximum amplitude (neglect spikes) of CHANNELS 1, 4 and 5 on the data sheets. Set all sensitivities on the Oscillograph Amplifier to OFF.	
d. VERB 22	NOUN 22	Flashing	
e. +00000	ENTR		
f. VERB 23	NOUN 22	Flashing	
g. +00000	ENTR		
h. VERB 41	NOUN 22	Displayed	
i. VERB 24	NOUN 01	ENTR	
j. 00405	ENTR		
k. VERB 21	NOUN 01	Flashing	
l. 40000	ENTR		
m. VERB 22	NOUN 01	Flashing	
n. 40077	ENTR		
37. Remove the jumper from J2-B of the Auxiliary Input panel and place it on J2-A to monitor IG + Δθ abort signal on the oscilloscope.			
38. Set the sensitivities on the Oscillograph Amplifier as follows:			
a. CHANNEL 1 to 5 MV/MM			
b. CHANNEL 4 to 10 MV/MM			
c. CHANNEL 5 to 50 MV/MM.			
39. Set the chart speed to 1 on the Oscillograph Control panel and set CHART DRIVE to MM/SEC.			
40. Perform the following DSKY operations:			
VERB 42	ENTR		
VERB 33	ENTR		
41. Measure and record the oscilloscope indications of A through E as represented on figure 1.			
42. When the Inner Gimbal indication on the Gimbal Position Control panel appears to stop, stop the Oscillograph and record the			

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JOB GIMBAL RESPONSE TEST			JDC 12619 REV A PAGE 6 OF 10
SUBSYSTEM	LEM G & N SYSTEM	ASSY	
b. MG TM Current on CHANNEL 4		+MG FRICTION TEST	
c. MG CDU Coarse Error on CHANNEL 5.			
43. Insure that CH2AC, CH4DC and CH5AC pushbuttons on the Oscillograph Signal Selector panel are lighted.			
49. Set the sensitivities on the Oscillograph Amplifiers as follows:			
a. CHANNEL 2 to 5 MV/MM			
b. CHANNEL 4 to 10 MV/MM			
c. CHANNEL 5 to 50 MV/MM			
50. Set the chart speed to 1 on the Oscillograph Control panel and set CHART SPEED to MM/SEC.			
51. Perform the following DSKY operations:			
VERB 42	ENTR		
VERB 33	ENTR		
NOTE: Perform step 52 as quickly as possible as measurement time is limited to approximately 4 minutes. If measurement cannot be completed before pulse torquing ends turn the oscillograph off and repeat steps 43 and 51 and complete measurements not taken.			
52. Measure and record the oscilloscope indication of A through E as represented on figure 1.			
53. When the Middle Gimbal Indicator on the Gimbal Position Control panel appears to stop, stop the Oscillograph. Set all sensitivities on the Oscillograph to OFF.			

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JOB GIMBAL RESPONSE TEST			JDC 12619 REV A PAGE 7 OF 10
SUBSYSTEM	LEM G & N SYSTEM	ASSY	
NOTE: Perform step 59 as quickly as possible as measurement time is limited to approximately 2 minutes. If measurement cannot be completed before pulse torquing ends turn the oscillograph off and repeat steps 54 and 58 and complete measurements not taken.			
59. Measure and record the oscilloscope indications of A through E as represented in figure 1.			
60. When the Middle Gimbal indication on the Gimbal Position Control panel appears to stop, stop the Oscillograph and record the maximum amplitude (neglect spikes) of CHANNEL 2, 4 and 5 on the data sheets. Set all sensitivities on the Oscillograph Amplifier to OFF.			
61. Remove all jumper cables placed during this procedure.			
62. Perform the following DSKY operations:			
VERB 41	NOUN 20	ENTR	
VERB 21	NOUN 22	Flashing	
+00000	ENTR		
VERB 22	NOUN 22	Flashing	
+00000	ENTR		
VERB 23	NOUN 23	Flashing	
+00000	ENTR		
VERB 41	NOUN 22	Displayed	

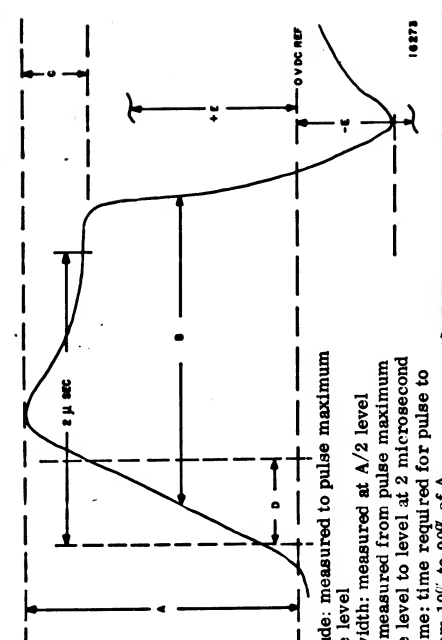
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JOB GIMBAL RESPONSE TEST			JDC 12619 REV A PAGE 8 OF 10
SUBSYSTEM	LEM G & N SYSTEM	ASSY	
c. +00000	ENTR		
d. Observe			
VERB 22	NOUN 22	Flashing	
e. +00000	ENTR		
f. Observe			
VERB 23	NOUN 22	Flashing	
g. +00000	ENTR		
h. Observe			
VERB 41	NOUN 20	Displayed	
i. VERB 36	ENTR		
69. Start the Oscillograph by setting the CHART DRIVE switch to MM/SEC.			
70. Set and hold the SERVO TEST switch on the TPA #2 in the up position.			
71. After a constant servo error is observed on CHANNEL 1 of the Oscillograph, release the SERVO TEST switch on TPA #2.			
72. After a constant servo error is observed on CHANNEL 1 of the Oscillograph, stop the Oscillograph.			
73. Record the IG stabilization loop response time on CHANNEL 1 of the Oscillograph Chart by measuring the time interval between releasing the SERVO TEST switch and the peak magnitude of the first overshoot. In addition, record the number of overshoots after the initial disturbance.			
MG STEP RESPONSE			
74. Set the following Channel sensitivities on the Oscillograph Amplifier panel:			
Channel	Sensitivity		
a. 1	10 MV/MM		
b. 2	50 MV/MM		
c. 3	10 MV/MM		

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JOB GIMBAL RESPONSE TEST		JDC 12619 REV A PAGE 9 OF 10	
SUBSYSTEM LEM G & N SYSTEM		ASSY	
OC STEP RESPONSE			
81. Set the following channel Sensitivity on the Oscillograph Amplifier panel:			
Channel	Sensitivity		
a. 1	10 MV/MM		
b. 2	10 MV/MM		
c. 3	50 MV/MM		
82. Remove the jumper of step 75 and connect as follows:			
TPA #2	TB 5-18 and TB 2.4		
83. Perform the following DSKY operations:			
a. VERB 41	NOUN 20	ENTR	
b. Observe	VERB 21	NOUN 22	Flashing
c. +00000	NOUN 22	ENTR	
d. Observe	VERB 22	NOUN 22	Flashing
e. +00000	NOUN 22	ENTR	
f. Observe	VERB 23	NOUN 23	Flashing
g. +00000	NOUN 22	ENTR	
h. Observe	VERB 41	NOUN 20	Displayed
i. VERB 36	ENTR		
84. Set and hold the SERVO TEST switch on the TPA #2 in the up position.			
85. After a constant servo error is observed on CHANNEL 3 of the Oscillograph, release the SERVO TEST switch on the TPA #2.			
86. After a constant servo error is observed on CHANNEL 3 of the Oscillograph, stop the Oscillograph.			
87. Record the OG stabilization loop response time on CHANNEL 3 of the			

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JOB GIMBAL RESPONSE TEST		JDC 12619 REV A PAGE 10 OF 10	
SUBSYSTEM LEM G & N SYSTEM		ASSY	
Figure 1. Waveform Description			
			
A - Amplitude, measured to pulse maximum positive level			
B - Pulse width: measured at A/2 level			
C - Droop: measured from pulse maximum positive level to level at 2 microsecond rise from 10% to 90% of A.			
D - Rise Time: time required for pulse to rise from 10% to 90% of A.			
E - Noise: (No pulse)			

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APOLLO 88N		JDC	
EQUIPMENT TEST		NO. 12619	
DATA SHEET 1 OF 4		REV. A	
JOB GIMBAL RESPONSE TEST		INITIAL TDR	

ASSEMBLY UNDER TEST		TEST HISTORY	
TITLE		DATE	
SER. NO.		TIME	
DWG		REV.	
END		END	
TOTAL ELAPSED		TOTAL ELAPSED	
MAJOR GROUND SUPPORT EQUIPMENT			
CONDUCTED BY			
NAME			
SER. NO.			
NAME			
SER. NO.			
APPROVED BY			
NAME/AFFILIATION			
JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE
4	28 VDC Bus voltage	vdc	27.75
6.a	OG Error signal**	mv	60
6.b	MG Error signal**	mv	60
6.c	IG Error signal**	mv	60
6.d	X Gyro Error signal**	mv	60
6.e	Z Gyro Error signal**	mv	60
7.a	OG TDA	vdc	20 p-p
7.b	MG TDA	vdc	20 p-p
7.c	IG TDA	vdc	20 p-p
16	OG - Δ abort	Refer to fig 1	
16.a.A	Amplitude	peak volts	4
16.a.B	Pulse width	μsec	2
16.a.C	Droop	volts	A/5
16.a.D	Rise Time	μsec	0.5

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EQUIPMENT TEST		NO. 12619	
DATA SHEET 2 OF 4		REV. A	
JOB GIMBAL RESPONSE TEST		INITIAL TDR	

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ ACC
16.a.E	Noise with respect to 0 vdc reference	volts	-4.0		+4.0	
16.b	IRIG PVR	vdc	5.94		6.06	
16.c	IRIG Torque	vdc	1.09		1.21	
16.d	Current Monitor					
16.d	IRIG SF voltage	vdc	5.94		6.06	
23	OG - Δ abort	Refer to fig 1				
23.A	Amplitude	peak volts	4		10	
23.B	Pulse width	μsec	2		4	
23.C	Droop	volts			A/5	
23.D	Rise Time	μsec			0.5	
23.E	Noise with respect to 0 vdc reference	volts	-4.0		+4.0	
24	OG CDU Fine Error on CH3	volt rms	-0.070		+0.070	
24	OG TM Current on CH4	vdc	-0.125		+0.125	
24	OG CDU Coarse Error on CH5	volt rms	-0.680		+0.680	
34	IG - Δ abort	Refer to fig 1				
34.A	Amplitude	peak volts	4		10	
34.B	Pulse width	μsec	2		4	
34.C	Droop	volts			A/5	
34.D	Rise Time	μsec			0.5	

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APOLLO G&N  
EQUIPMENT TEST  
DATA SHEET 3 OF 4

JDC  
NO. 12619  
REV. A

JOB GIMBAL RESPONSE TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ ACC
34. E	Noise with respect to 0 vdc reference	volts	-4.0		+4.0	
41	IG + $\Delta\theta$ abort	Refer to fig 1				
41. A	Amplitude	peak volts	4		10	
41. B	Pulse width	$\mu$ sec	2		4	
41. C	Droop	volts			$\frac{A}{5}$	
41. D	Rise Time	$\mu$ sec			0.5	
41. E	Noise with respect to 0 vdc reference	volts	-4.0		+4.0	
42	IG CDU Fine Error on CH1	volt rms	-0.070		+0.070	
42	IG TM Current on CH4	vdc	-0.125		+0.125	
42	IG CDU Coarse Error on CH5	volt rms	-0.680		+0.680	
52	MG - $\Delta\theta$ abort	Refer to fig 1				
52. A	Amplitude	peak volts	4		10	
52. B	Pulse width	$\mu$ sec	2		4	
52. C	Droop	volts			$\frac{A}{5}$	
52. D	Rise Time	$\mu$ sec			0.5	
52. E	Noise with respect to 0 vdc reference	volts	-4.0		+4.0	
59	MG + $\Delta\theta$ abort	Refer to fig 1				

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EQUIPMENT TEST  
DATA SHEET 4 OF 4

JDC  
NO. 12619  
REV. A

JOB GIMBAL RESPONSE TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ ACC
59. A	Amplitude	peak volts	4		10	
59. B	Pulse width	$\mu$ sec	2		4	
59. C	Droop	volts			$\frac{A}{5}$	
59. D	Rise Time	$\mu$ sec			0.5	
59. E	Noise with respect to 0 vdc reference	volts	-4.0		+4.0	
60	MG CDU Fine Error on CH2	volt rms	-0.070		+0.070	
60	MG TM Current on CH4	vdc	-0.125		+0.125	
60	MG CDU Coarse Error on CH5	volt rms	-0.680		+0.680	
73	IG stabilization loop response	sec	0		0.8	
	Number of over- shoots	number	0		2	
80	MG stabilization loop response	sec	0		0.8	
	Number of over- shoots	number	0		2	
87	OG stabilization loop response	sec	0		0.8	
	Number of over- shoots	number	0		2	
	AGC Displays	All DSKY displays and indications reacted as specified				

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SUBSYSTEM LEM G & N SYSTEM

DESCRIPTION A gimbal friction test is performed by driving the Outer and Inner gimbals through plus and minus 360°, one at a time, and the Middle gimbal through 135°. During the slow periods the Fine and Coarse CDU errors and gimbal torque motor current are monitored on the Oscilloscope. In addition the plus and minus Δθ abort signal characteristics are checked during each gimbal slew. After the gimbal friction test the OG, MG and IG stab loop responses are tested by providing a step input to each DC Stab Amp.

Rev. Let.	Date	TDRR NO.	PAGES REVISED	APPROVAL	REFERENCES
A	7-5-66	30046	1-7	2	PS 6015000
B	7-21-66	30273	-	2	MM-21 ACN-11
					EA-41 MB-11
					IMPORTANT See below
					INTERVAL
					TOOLS AND MATERIAL

- IMPORTANT: 1. All starred (\*\*) parameters on the Data Sheet must be corrected by the multiplication factor found on the signal identification drawings to obtain the true value.
2. The OSCILLOGRAPH sensitivities called out in this JDC are initial values. Operators may change sensitivities as required for optimum resolution.
- INITIALIZATION
1. Establish a MASTER INITIALIZATION condition.

2. (Deleted).
3. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 173.
4. Measure the 28 VDC Bus voltage indicated on the DVM. Record the indication.
5. Insure that the Inner, Middle and Outer gimbals are set to approximately 0.0° as indicated on the Gimbal Position Control panel. If not, perform the following DSKY operations:
- a. VERB 41 NOUN 20 ENTR
- b. Observe VERB 21 NOUN 22 Flashing ENTR
- c. +00000
- d. Observe VERB 22 NOUN 22 Flashing ENTR
- e. +00000

VERIFICATION WITH SIDL REQUIRED BEFORE USE

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SUBSYSTEM LEM G & N SYSTEM

13. Set the sensitivities on the Oscillograph Amplifier as follows:
- a. CHANNEL 3 to 5 MV/MM
- b. CHANNEL 4 to 10 MV/MM
- c. CHANNEL 5 to 50 MV/MM.
14. Set the chart speed to 1 on the Oscillograph Control panel and set CHART DRIVE to MM/SEC.
15. Perform the following DSKY operations:
- VERB 42 ENTR
- VERB 33 ENTR
- NOTE: If the measurements in step 16 cannot be completed before pulse torquing ends, turn the Oscilloscope off and repeat steps 8 and 15 and complete measurements not taken.
16. Measure and record the following signals:
- a. Scope Indications A through E (figure 1)
- b. IRIG PVR (PIPA & IRIG SF Selector switch, position 10) on the Current Source Monitor per JDC 18016
- c. IRIG Torque Current Monitor (PIPA & IRIG SF Selector switch, position 11) on the Current Source Monitor, JDC 18016
- e. IRIG Scale Factor (PIPA & IRIG SF Selector switch, position 12) on the Current Source Monitor per JDC 18016.
17. When the Outer Gimbal Indicator on the Gimbal Position Control panel appears to stop, stop the Oscilloscope. Set all sensitivities on the Oscilloscope to OFF.

- +OG FRICTION TEST
18. Perform the following DSKY operations:
- a. VERB 41 NOUN 20 ENTR
- b. VERB 21 NOUN 22 Flashing ENTR
- c. +00000
- d. VERB 22 NOUN 22 Flashing ENTR
- e. +00000
- f. VERB 23 NOUN 22 Flashing ENTR
- g. +00000
- h. VERB 41 NOUN 22 Displayed ENTR
- i. VERB 24 NOUN 01 ENTR
- j. 00403
- k. VERB 21 NOUN 01 Flashing ENTR
- l. 40000
- m. VERB 22 NOUN 01 Flashing ENTR
- n. 40077
19. Remove jumper from J2-F of the Auxiliary Input panel and place it on J2-E to monitor OG + Δθ abort signal on the oscilloscope.
20. Set the sensitivities on the Oscillograph Amplifier as follows:
- a. CHANNEL 3 to 5 MV/MM
- b. CHANNEL 4 to 10 MV/MM
- c. CHANNEL 5 to 50 MV/MM.
21. Set the chart speed to 1 on the Oscilloscope Control panel and set CHART DRIVE to MM/SEC.
22. Perform the following DSKY operations:
- VERB 42 ENTR
- VERB 33 ENTR

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- f. Observe VERB 23 NOUN 22 Flashing ENTR
- g. +00000
- h. Observe VERB 41 NOUN 20 Displayed ENTR
- i. VERB 36
- STATIC LOOP PARAMETERS
6. Set the Primary Signal Selector panel to monitor the following signals on the PVM. Record the in-phase voltage of each:
- Voltage
- CROSSBAR CONTROL
- a. OG Error Signal 133
- b. MG Error Signal 134
- c. IG Error Signal 135
- d. X Gyro Error Signal 233
- e. Z Gyro Error Signal 234
7. Set the Primary Signal Selector panel to monitor the following signals on the DVM. Record the indication of each:
- Voltage
- CROSSBAR CONTROL
- a. OG TDA 136
- b. MG TDA 137
- c. IG TDA 138

8. Perform the following DSKY operations:
- a. VERB 41 NOUN 20 ENTR
- b. VERB 21 NOUN 22 Flashing ENTR
- c. +00000
- d. VERB 22 NOUN 22 Flashing ENTR
- e. +00000
- f. VERB 23 NOUN 22 Flashing ENTR
- OG FRICTION
10. Set SCOPE "A" INPUT to AUX on the Primary Signal Selector panel. Set DIFF amp to ON on the Dual Beam Oscilloscope.
11. Set CHANNEL 3 on Oscilloscope Signal Selector panel to 5 and CHANNEL 4 and 5 to AUX and monitor the following signals:
- a. OG CDU Fine Error on CHANNEL 3
- b. OG TM current on CHANNEL 4
- c. OG CDU Coarse Error on CHANNEL 5.
12. Insure that CH3AC, CH4DC and CH5AC pushbuttons on the Oscilloscope Signal Selector panel are lighted.

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23. Measure and record the oscilloscope indication of A through E as represented on figure 1.
24. When the Outer Gimbal Indicator on the Gimbal Position Control panel appears to stop, stop the Oscilloscope and record the maximum amplitude (neglect spikes) of CHANNELS 3, 4, and 5 on the data sheets. Set all sensitivities on the Oscilloscope Amplifiers to OFF.
- IG FRICTION TEST
25. Perform the following DSKY operations:
- a. VERB 41 NOUN 20 ENTR
- b. VERB 21 NOUN 22 Flashing ENTR
- c. +00000
- d. VERB 22 NOUN 22 Flashing ENTR
- e. +00000
- f. VERB 23 NOUN 22 Flashing ENTR
- g. +00000
- h. VERB 41 NOUN 22 Displayed ENTR
- i. VERB 24 NOUN 21 ENTR
- j. 00465
- k. VERB 21 NOUN 01 Flashing ENTR
- l. 37777
- m. VERB 22 NOUN 01 Flashing ENTR
- n. 37743
26. Remove the jumper from J2-E of Auxiliary Input panel and place it on J2-B to monitor IG - Δθ abort signal on the scope.
27. Remove the jumper from TB1 45 of TPA #2 and place it on TB 2-31 of TPA #2.
28. Remove the jumper TB 2-35 and place it on TB 2-47 of TPA #2.

29. Set CHANNEL 1 on the Oscilloscope Signal Selector panel to 5 and CHANNEL 4 and 5 to AUX and monitor the following signals:
- a. IG CDU Fine Error on CHANNEL 1
- b. IG TM Current on CHANNEL 4
- c. IG CDU Coarse Error on CHANNEL 5.
30. Insure that CH1AC, CH4DC and CH5AC pushbuttons on the Oscilloscope Signal Selector panel are lighted.
31. Set the sensitivities on the Oscilloscope Amplifier as follows:
- a. CHANNEL 1 to 5 MV/MM
- b. CHANNEL 4 to 10 MV/MM
- c. CHANNEL 5 to 50 MV/MM
32. Set the chart speed to 1 on the Oscillograph Control panel and set CHART DRIVE to MM/SEC.
33. Perform the following DSKY operations:
- VERB 42 ENTR
- VERB 33 ENTR
34. Measure and record the oscilloscope indications of A through E as represented on figure 1.
35. When the Inner Gimbal Indicator on the Gimbal Position Control panel appears to stop, stop the Oscilloscope. Set all sensitivities on the Oscilloscope to OFF.
- +IG FRICTION TEST
36. Perform the following DSKY operations:
- a. VERB 41 NOUN 20 ENTR
- b. VERB 21 NOUN 22 Flashing ENTR

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c. +00000	ENTR	maximum amplitude (neglect spikes) of CHANNELS 1, 4 and 5 on the data sheets.
d. VERB 22	NOUN 22	Flashing
e. +00000	ENTR	Set all sensitivities on the Oscillograph Amplifier to OFF.
f. VERB 23	NOUN 22	Flashing
g. +00000	ENTR	-MG FRICTION TEST
h. VERB 41	NOUN 22	Displayed
i. VERB 24	NOUN 01	ENTR
j. 00405	ENTR	43. Perform the following DSKY operations:
k. VERB 21	NOUN 01	Flashing
l. 40000	ENTR	a. VERB 41 NOUN 20 ENTR
m. VERB 22	NOUN 01	Flashing
n. 40077	ENTR	b. VERB 21 NOUN 22 Flashing
37. Remove the jumper from J2-B of the Auxiliary Input panel and place it on J2-A to monitor IG + $\Delta\theta$ abort signal on the oscilloscope.		c. +00000 ENTR
38. Set the sensitivities on the Oscillograph Amplifier as follows:		d. VERB 22 NOUN 22 Flashing
a. CHANNEL 1 to 5 MV/MM		e. +00000 ENTR
b. CHANNEL 4 to 10 MV/MM		f. VERB 23 NOUN 22 Flashing
c. CHANNEL 5 to 50 MV/MM.		g. +06750 ENTR
39. Set the chart speed to 1 on the Oscillograph Control panel and set CHART DRIVE to MM/SEC.		h. VERB 41 NOUN 22 Display'd
40. Perform the following DSKY operations:		i. VERB 24 NOUN 01 ENTR
VERB 42 ENTR		j. 00407 ENTR
VERB 33 ENTR		k. VERB 21 NOUN 01 Flashing
41. Measure and record the oscilloscope indications of A through E as represented on figure 1.		l. 14000 ENTR
42. When the Inner Gimbal indication on the Gimbal Position Control panel appears to stop, stop the Oscillograph and record the		m. VERB 22 NOUN 01 Flashing
		n. 00000 ENTR
		44. Remove the jumper from J2-A of the Auxiliary Input panel and place it on J2-D to monitor MG - $\Delta\theta$ abort signal on the oscilloscope.
		45. Remove the jumper from TB 2-31 and place it on TBA-2-32 of TPA #2.
		46. Remove the jumper from TB 2-47 and place it on TB 2-41 of TPA #2.
		47. Set CHANNEL 2 on the Oscillograph Signal Selector panel to 5 and CHANNEL 4 and 5 to AUX and monitor the following signals:
		a. MG CDU Fine Error on CHANNEL 2

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b. MG TM Current on CHANNEL 4		-MG FRICTION TEST
c. MG CDU Coarse Error on CHANNEL 5.		54. Perform the following DSKY operations:
48. Insure that CH2AC, CH4DC and CH5AC pushbuttons on the Oscillograph Signal Selector panel are lighted.		a. VERB 41 NOUN 20 ENTR
49. Set the sensitivities on the Oscillograph Amplifiers as follows:		b. VERB 21 NOUN 22 Flashing
a. CHANNEL 2 to 5 MV/MM		c. +00000 ENTR
b. CHANNEL 4 to 10 MV/MM		d. VERB 22 NOUN 22 Flashing
c. CHANNEL 5 to 50 MV/MM		e. +00000 ENTR
50. Set the chart speed to 1 on the Oscillograph Control panel and set CHART SPEED to MM/SEC.		f. VERB 23 NOUN 22 Flashing
51. Perform the following DSKY operations:		g. -06750 ENTR
VERB 42 ENTR		h. VERB 41 NOUN 22 Display'd
VERB 33 ENTR		i. VERB 42 NOUN 01 ENTR
NOTE: Perform step 52 as quickly as possible as measurement time is limited to approximately 4 minutes. If measurement cannot be completed before pulse torquing ends turn the oscillograph off and repeat steps 43 and 51 and complete measurements not taken.		j. 00407 ENTR
52. Measure and record the oscilloscope indication of A through E as represented on figure 1.		k. VERB 21 NOUN 01 Flashing
53. When the Middle Gimbal Indicator on the Gimbal Position Control panel appears to stop, stop the Oscillograph. Set all sensitivities on the Oscillograph to OFF.		l. 54000 ENTR
		m. VERB 22 NOUN 01 Flashing
		n. 40000 ENTR
		55. Remove the jumper from J2-D of the Auxiliary Input panel and place it on J2-C to monitor MG + $\Delta\theta$ abort signal on the scope.
		56. Set the sensitivities on the Oscillograph Amplifier as follows:
		a. CHANNEL 2 to 5 MV/MM
		b. CHANNEL 4 to 10 MV/MM
		c. CHANNEL 5 to 50 MV/MM.
		57. Set the chart speed to 1 on the Oscillograph Control panel and set CHART SPEED to MM/SEC.
		58. Perform the following DSKY operations:
		VERB 42 ENTR
		VERB 33 ENTR

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SUBSYSTEM	LEM G & N SYSTEM	ASSY
NOTE: Perform step 59 as quickly as possible as measurement time is limited to approximately 2 minutes. If measurement cannot be completed before pulse torquing ends turn the oscillograph off and repeat steps 54 and 58 and complete measurements not taken.		63. Set the following controls on the Oscillograph Signal Selector panel to monitor the associated signals:
59. Measure and record the oscilloscope indications of A through E as represented in figure 1.		CHANNEL Position Signal
60. When the Middle Gimbal indication on the Gimbal Position Control panel appears to stop, stop the Oscillograph and record the maximum amplitude (neglect spikes) of CHANNEL 2, 4 and 5 on the data sheets. Set all sensitivities on the Oscillograph Amplifier to OFF.		a. 1-2 IG & Y Gyro Error Signal
61. Remove all jumper cables placed during this procedure.		b. 2-2 MG Error Signal
62. Perform the following DSKY operations:		c. 3-2 OG Error Signal
VERB 41 NOUN 20 ENTR		64. Insure that CH3AC pushbutton on the Oscillograph Signal Selector panel is lit.
VERB 21 NOUN 22 Flashing		65. Press the CHART SPEEDS 5 pushbutton on the Oscillograph Control panel and set the following channel sensitivities on the Oscillograph Amplifier panel:
+00000 ENTR		Channel Sensitivity
VERB 22 NOUN 22 Flashing		a. 1 50 MV/MM
+00000 ENTR		b. 2 10 MV/MM
VERB 23 NOUN 23 Flashing		c. 3 10 MV/MM
+00000 ENTR		66. Set the PHASE SHIFT SELECTOR on the phase sensitive Demodulators of CHANNELS 1, 2 and 3 to 3200 ~ 0 deg.
VERB 41 NOUN 22 Display'd		IG STEP RESPONSE
		67. Connect a jumper between:
		TPA #2 TB 5-27 and
		TPA #2 TB 2-11
		68. Perform the following DSKY operations:
		a. VERB 41 NOUN 20 ENTR
		b. Observe VERB 21 NOUN 22 Flashing

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SUBSYSTEM	LEM G & N SYSTEM	ASSY
c. +00000	ENTR	75. Remove the jumper of step 67 and connect as follows:
d. Observe VERB 22 NOUN 22 Flashing		TPA #2 TP 5-18 and
e. +00000 ENTR		TPA #2 TB 2-10
f. Observe VERB 23 NOUN 22 Flashing		76. Perform the following DSKY operations:
g. +00000 ENTR		a. VERB 41 NOUN 20 ENTR
h. Observe VERB 41 NOUN 20 Display'd		b. Observe VERB 21 NOUN 22 Flashing
i. VERB 36 ENTR		c. +00000 ENTR
69. Start the Oscillograph by setting the CHART DRIVE switch to MM/SEC.		d. Observe VERB 22 NOUN 22 Flashing
70. Set and hold the SERVO TEST switch on the TPA #2 in the up position.		e. +00000 ENTR
71. After a constant servo error is observed on CHANNEL 1 of the Oscillograph, release the SERVO TEST switch on TPA #2.		f. Observe VERB 23 NOUN 22 Flashing
72. After a constant servo error is observed on CHANNEL 1 of the Oscillograph, stop the Oscillograph.		g. +00000 ENTR
73. Record the IG stabilization loop response time on CHANNEL 1 of the Oscillograph Chart by measuring the time interval between releasing the SERVO TEST switch and the peak magnitude of the first overshoot. In addition, record the number of overshoots after the initial disturbance.		h. Observe VERB 42 NOUN 22 Display'd
MG STEP RESPONSE		i. VERB 36 ENTR
74. Set the following Channel sensitivities on the Oscillograph Amplifier panel:		77. Set and hold the SERVO TEST switch on the TPA #2 in the up position.
Channel Sensitivity		78. After a constant servo error is observed on CHANNEL 2 of the Oscillograph, release the SERVO TEST switch on the TPA #2.
a. 1 10 MV/MM		79. After a constant servo error is observed on CHANNEL 2 of the Oscillograph, stop the Oscillograph.
b. 2 50 MV/MM		80. Record the MG stabilization loop response time on CHANNEL 2 of the Oscillograph Chart by measuring the time interval between releasing the SERVO TEST switch and the peak magnitude of the first overshoot. In addition, record the number of overshoots after the initial disturbance.
c. 3 10 MV/MM		

SUBSYSTEM LEM G &amp; N SYSTEM ASSY

## OG STEP RESPONSE

81. Set the following channel Sensitivity on the Oscillograph Amplifier panel:

Channel	Sensitivity
a. 1	10 MV/MM
b. 2	10 MV/MM
c. 3	50 MV/MM

82. Remove the jumper of step 75 and connect as follows:

TPA #2	TB 5-18 and
TPA #2	TB 2.4

83. Perform the following DSKY operations:

a. VERB 41	NOUN 20	ENTR
b. Observe	VERB 21	Flashing
c. +00000	NOUN 22	ENTR
d. Observe	VERB 22	Flashing
e. +00000	NOUN 22	ENTR
f. Observe	VERB 23	Flashing
g. +00000	NOUN 23	ENTR

h. Observe  
VERB 41 NOUN 20 Displayed  
VERB 36 ENTR

84. Set and hold the SERVO TEST switch on the TPA #2 in the up position.

85. After a constant servo error is observed on CHANNEL 3 of the Oscillograph, release the SERVO TEST switch on the TPA #2.

86. After a constant servo error is observed on CHANNEL 3 of the Oscillograph, stop the Oscillograph.

87. Record the OG stabilization loop response time on CHANNEL 3 of the

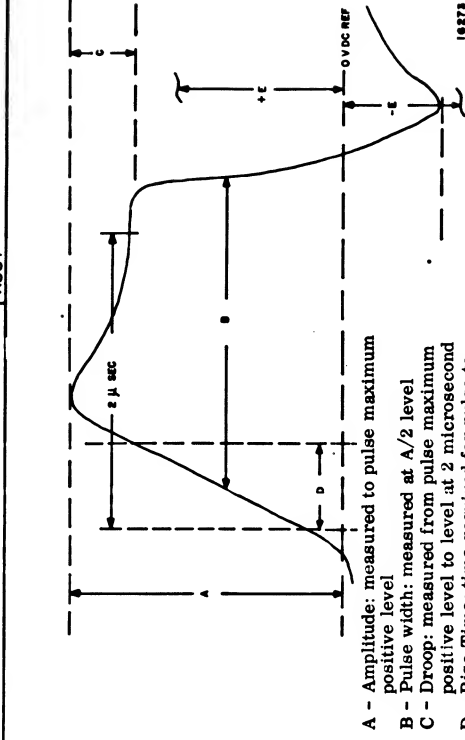


Figure 1. Waveform Description

- A - Amplitude: measured to pulse maximum positive level  
B - Pulse width: measured at A/2 level  
C - Droop: measured from pulse maximum positive level to level at 2 microsecond rise from 10% to 90% of A.  
D - Rise Time: time required for pulse to rise from 10% to 90% of A.  
E - Noise: (No pulse)

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EQUIPMENT TEST

DATA SHEET 2 OF 4

JDC  
NO. 12619  
REV. B  
INITIAL TDRR

JOB GIMBAL RESPONSE TEST

ASSEMBLY UNDER TEST				TEST HISTORY			
TITLE		DATE	START	END	SITE / LOCATION		
SER. NO.	DWG	REV.	TIME	START	END	TOTAL ELAPSED	
MAJOR GROUND SUPPORT EQUIPMENT							
NAME		SER. NO.		CAL DATE			
NAME		SER. NO.		CAL DATE			
CONDUCTED BY				APPROVED BY			
NAME/AFFILIATION				NAME/AFFILIATION			
JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ ACC	
4	28 VDC Bus voltage	vdc	27.75		28.25		
6.a	OG Error signal**	mv			60		
6.b	MG Error signal**	mv			60		
6.c	IG Error signal**	mv			60		
6.d	X Gyro Error signal**	mv			60		
6.e	Z Gyro Error signal**	mv			60		
7.a	OG TDA	vdc			20 p-p		
7.b	MG TDA	vdc			20 p-p		
7.c	IG TDA	vdc			20 p-p		
16	OG - Δθ abort	Refer to fig 1					
16.a.A	Amplitude	peak	4		10		
16.a.B	Pulse width	μsec	2		4		
16.a.C	Droop	volts			A/5		
16.a.D	Rise Time	μsec			0.5		

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SUBSYSTEM LEM G &amp; N SYSTEM ASSY

APOLLO 8 & N  
EQUIPMENT TEST  
DATA SHEET 2 OF 4JDC  
NO. 12619  
REV. B

JOB GIMBAL RESPONSE TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ ACC
16.a.E	Noise with respect to 0 vdc reference	volts	-4.0		-4.0	
16.b	IRIG PVR	vdc	5.94		6.06	
16.c	IRIG Torque	vdc	1.000		1.12	
16.d	Current Monitor					
16.d	IRIG SF voltage	vdc	5.94		6.06	
23	OG + Δθ abort	Refer to fig 1				
23.A	Amplitude	peak volts	4		10	
23.B	Pulse width	μ sec	2		4	
23.C	Droop.	volts			A/5	
23.D	Rise Time	μ sec			0.5	
23.E	Noise with respect to 0 vdc reference	volts	-4.0		-4.0	
24	OG CDU Fine Error on CH3	volt rms	-0.070		-0.070	
24	OG FM Current on CH4	vdc	-0.125		-0.125	
24	OG CDU Coarse Error on CH5	volt rms	-0.680		-0.680	
34	IG - Δθ abort	Refer to fig 1				
34.A	Amplitude	peak volts	4		10	
34.B	Pulse width	μ sec	2		4	
34.C	Droop	volts			A/5	
34.D	Rise Time	μ sec			0.5	

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APOLLO G&N  
EQUIPMENT TEST  
DATA SHEET 3 OF 4

JDC  
NO. 12619  
REV. B

JOB GIMBAL RESPONSE TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ ACC
34.E	Noise with respect to 0 vdc reference	volts	-4.0		+4.0	
41	IG + Δθ abort	Refer to fig 1				
41.A	Amplitude	peak volts	4		10	
41.B	Pulse width	μsec	2		4	
41.C	Droop	volts			$\frac{A}{5}$	
41.D	Rise Time	μsec			0.5	
41.E	Noise with respect to 0 vdc reference	volts	-4.0		+4.0	
42	IG CDU Fine Error on CH1	volt rms	-0.070		+0.070	
42	IG TM Current on CH4	vdc	-0.125		+0.125	
42	IG CDU Coarse Error on CH5	volt rms	-0.680		+0.680	
52	MG -Δθ abort	Refer to fig 1				
52.A	Amplitude	peak volts	4		10	
52.B	Pulse width	μsec	2		4	
52.C	Droop	volts			$\frac{A}{5}$	
52.D	Rise Time	μsec			0.5	
52.E	Noise with respect to 0 vdc reference	volts	-4.0		+4.0	
59	MG + Δθ abort	Refer to fig 1				

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APOLLO G&N  
EQUIPMENT TEST  
DATA SHEET 4 OF 4  
JOB GIMBAL RESPONSE TEST

JDC  
NO. 12619  
REV. B

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ ACC
59.A	Amplitude	peak volts	4		10	
59.B	Pulse width	μsec	2		4	
59.C	Droop	volts			$\frac{A}{5}$	
59.D	Rise Time	μsec			0.5	
59.E	Noise with respect to 0 vdc reference	volts	-4.0		+4.0	
60	MG CDU Fine Error on CH2	volt rms	-0.070		+0.070	
60	MG TM Current on CH4	vdc	-0.125		+0.125	
60	MG CDU Coarse Error on CH5	volt rms	-0.680		+0.680	
73	IG stabilization loop response	sec	0		0.8	
	Number of over- shoots	number	0		2	
80	MG stabilization loop response	sec	0		0.8	
	Number of over- shoots	number	0		2	
87	OG stabilization loop response	sec	0		0.8	
	Number of over- shoots	number	0		2	
	AGC Displays	All DSKY displays and indications reacted as specified				

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SUBSYSTEM LEM G & N SYSTEM  
DESCRIPTION A gimbal friction test is performed by driving the Outer and Inner gimbals through plus and minus 360°, one at a time, and the Middle gimbal through 135°. During the slow periods the Fine and Coarse CDU errors and gimbal torque motor current are monitored on the Oscillograph. In addition the plus and minus Δθ abort signal characteristics are checked during each gimbal slew. After the gimbal friction test the OG, MG and IG stab loop responses are tested by providing a step input to each DC Stab Amp.

Rev. Let.	Date	TDRR NO.	PAGES REVISED	APPROVAL	REFERENCES
A	7-5-66	30046	1 - 7	2	MM/ACM
B	7-21-66	30273	2	EA	MB
C	8-5-66	30522	2, 4, 6-9	1	EA
					IMPORTANT See below
					INTERVAL
					TOOLS AND MATERIAL

- IMPORTANT: 1. All started (\*\*) parameters on the Data Sheet must be corrected by the multiplication factor found on the signal identification drawings to obtain the true value.
2. The OSCILLOGRAPH sensitivities called out in this JDC are initial values. Operators may change sensitivities as required for optimum resolution.
- INITIALIZATION
1. Establish a MASTER INITIALIZATION condition.
2. (Deleted).
3. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 173.
4. Measure the 28 VDC Bus voltage indicated on the DVM. Record the indication.
5. Insure that the Inner, Middle and Outer gimbals are set to approximately 0.0° as indicated on the Gimbal Position Control panel. If not, perform the following DSKY operations:
- a. VERB 41 NOUN 20 ENTR
- b. Observe VERB 21 NOUN 22 Flashing ENTR
- c. +00000
- d. Observe VERB 22 NOUN 22 Flashing ENTR
- e. +00000

VERIFICATION WITH SIDL REQUIRED BEFORE USE

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SUBSYSTEM	LEM G & N SYSTEM	ASSY
f. Observe VERB 23 NOUN 22 Flashing		g. +00000 ENTR
g. +00000 ENTR		h. VERB 41 NOUN 22 Displayed
h. Observe VERB 41 NOUN 20 Displayed		i. VERB 24 NOUN 01 ENTR
i. VERB 36 ENTR		j. 00403 ENTR
STATIC LOOP PARAMETERS		k. VERB 21 NOUN 01 Flashing
6. Set the Primary Signal Selector panel to monitor the following signals on the PVM. Record the in-phase voltage of each:		l. 37777 ENTR
Voltage		m. VERB 22 NOUN 01 Flashing
CROSSBAR CONTROL		n. 37743 ENTR
133		9. Place jumpers between the following points:
134		GSE From To
135		AIP DIRECT PROBES CH4DC
233		AIP OUTPUT
234		AIP BUFFERED PROBES CH5AC
7. Set the Primary Signal Selector panel to monitor the following signals on the oscilloscope. Record the peak-to-peak indications of each:		AIP J2F (OG-Δθ Abort) SCOPE
Voltage		TPA#2 DIRECT PROBE TB1 -45
136		(h) 49 (lo)
137		TPA#2 BUFFERED PROBE TB2 -35
138		(h) 18 (lo)
-OG FRICTION		10. Set SCOPE "A" INPUT to AUX on the Primary Signal Selector panel. Set DIFF amp to ON on the Dual Beam Oscilloscope.
8. Perform the following DSKY operations:		11. Set CHANNEL 3 on Oscillograph Signal Selector panel to 5 and CHANNEL 4 and 5 to AUX and monitor the following signals:
a. VERB 41 NOUN 20 ENTR		a. OG CDU Fine Error on CHANNEL 3
b. VERB 21 NOUN 22 Flashing		b. OG TM current on CHANNEL 4
c. +00000 ENTR		c. OG CDU Coarse Error on CHANNEL 5.
d. VERB 22 NOUN 22 Flashing		12. Insure that CH3AC, CH4DC and CH5AC pushbuttons on the Oscillograph Signal Selector panel are lighted.
e. +00000		
f. VERB 23 NOUN 22 Flashing		

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SUBSYSTEM	LEM G & N SYSTEM	ASSY
13. Set the sensitivities on the Oscillograph Amplifier as follows:		OG FRICTION TEST
a. CHANNEL 3 to 5 MV/MM		18. Perform the following DSKY operations:
b. CHANNEL 4 to 10 MV/MM		a. VERB 41 NOUN 20 ENTR
c. CHANNEL 5 to 50 MV/MM		b. VERB 21 NOUN 22 Flashing
14. Set the chart speed to 1 on the Oscillograph Control panel and set CHART DRIVE to MM/SEC.		c. +00000 ENTR
15. Perform the following DSKY operations:		d. VERB 22 NOUN 22 Flashing
VERB 42 ENTR		e. +00000 ENTR
VERB 33 ENTR		f. VERB 23 NOUN 22 Flashing
NOTE: If the measurements in step 16 cannot be completed before pulse torquing ends, turn the Oscillograph off and repeat steps 8 and 15 and complete measurements not taken.		g. +00000 ENTR
16. Measure and record the following signals:		h. VERB 41 NOUN 22 Displayed
a. Scope Indications A through E (figure 1)		i. VERB 24 NOUN 01 ENTR
b. IRIG PVR (PIPA & IRIG SF Selector switch, position 10) on the Current Source Monitor per JDC 18016		j. 00403 ENTR
c. IRIG Torque Current Monitor (PIPA & IRIG SF Selector switch, position 11) on the Current Source Monitor, JDC 18016		k. VERB 21 NOUN 01 Flashing
e. IRIG Scale Factor (PIPA & IRIG SF Selector switch, position 12) on the Current Source Monitor per JDC 18016.		l. 40000 ENTR
17. When the Outer Gimbal Indicator on the Gimbal Position Control panel appears to stop, stop the Oscillograph. Set all sensitivities on the Oscillograph to OFF.		m. VERB 22 NOUN 01 Flashing
		n. 40077 ENTR
		19. Remove jumper from J2-F of the Auxiliary Input panel and place it on J2-E of the oscilloscope.
		20. Set the sensitivities on the Oscillograph Amplifier as follows:
		a. CHANNEL 3 to 5 MV/MM
		b. CHANNEL 4 to 10 MV/MM
		c. CHANNEL 5 to 50 MV/MM.
		21. Set the chart speed to 1 on the Oscillograph Control panel and set CHART DRIVE to MM/SEC.
		22. Perform the following DSKY operations:
		VERB 42 ENTR
		VERB 33 ENTR

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SUBSYSTEM	LEM G & N SYSTEM	ASSY
23. Measure and record the oscilloscope indication of A through E as represented on figure 1.		29. Set CHANNEL 1 on the Oscilloscope Signal Selector panel to 5 and CHANNEL 4 and 5 to AUX and monitor the following signals:
24. When the Outer Gimbal Indicator on the Gimbal Position Control panel appears to stop, stop the Oscillograph and record the maximum amplitude (neglect spikes) of CHANNELS 3, 4, and 5 on the data sheets. Set all sensitivities on the Oscillograph Amplifiers to OFF.		a. IG CDU Fine Error on CHANNEL 1
-IG FRICTION TEST		b. IG TM Current on CHANNEL 4
25. Perform the following DSKY operations:		c. IG CDU Coarse Error on CHANNEL 5.
a. VERB 41 NOUN 20 ENTR		30. Insure that CH1AC, CH4DC and CH5AC pushbuttons on the Oscillograph Signal Selector panel are lighted.
b. VERB 21 NOUN 22 Flashing		31. Set the sensitivities on the Oscillograph Amplifier as follows:
c. +00000 ENTR		a. CHANNEL 1 to 5 MV/MM
d. VERB 22 NOUN 22 Flashing		b. CHANNEL 4 to 10 MV/MM
e. +00000 ENTR		c. CHANNEL 5 to 50 MV/MM
f. VERB 23 NOUN 22 Flashing		32. Set the chart speed to 1 on the Oscillograph Control panel and set CHART DRIVE to MM/SEC.
g. +00000 ENTR		33. Perform the following DSKY operations:
h. VERB 41 NOUN 22 Displayed		VERB 42 ENTR
i. VERB 24 NOUN 01 ENTR		VERB 33 ENTR
j. 00405 ENTR		34. Measure and record the oscilloscope indications of A through E as represented on figure 1.
k. VERB 21 NOUN 01 Flashing		35. When the Inner Gimbal Indicator on the Gimbal Position Control panel appears to stop, stop the Oscillograph. Set all sensitivities on the Oscillograph to OFF.
l. 37777 ENTR		-IG FRICTION TEST
m. VERB 22 NOUN 01 Flashing		36. Perform the following DSKY operations:
n. 37743 ENTR		a. VERB 41 NOUN 20 ENTR
26. Remove the jumper from J2-E of Auxiliary Input panel and place it on J2-B to monitor IG - Δθ abort signal on the scope.		b. VERB 21 NOUN 22 Flashing
27. Remove the jumper from TBI 45 of TPA #2 and place it on TB 2-31 of TPA #2.		
28. Remove the jumper TB 2-35 and place it on TB 2-47 of TPA #2.		

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JOB GIMBAL RESPONSE TEST			JDC 12619 REV C PAGE 5 OF 10
SUBSYSTEM LEM G & N SYSTEM		ASSY	
c. +00000	ENTR	maximum amplitude (neglect spikes) of CHANNELS 1, 4 and 5 on the data sheets. Set all sensitivities on the Oscillograph Amplifier to OFF.	
d. VERB 22	NOUN 22	Flashing	
e. +00000	ENTR	Flashing	
f. VERB 23	NOUN 22	Flashing	
g. +00000	ENTR	Flashing	
h. VERB 41	NOUN 22	Displayed	
i. VERB 24	NOUN 01	ENTR	
j. 00405	ENTR	ENTR	
k. VERB 21	NOUN 01	Flashing	
l. 40000	ENTR	ENTR	
m. VERB 22	NOUN 01	Flashing	
n. 40077	ENTR	ENTR	
37. Remove the jumper from J2-B of the Auxiliary Input panel and place it on J2-A to monitor IG + $\Delta\theta$ abort signal on the oscilloscope.			
38. Set the sensitivities on the Oscillograph Amplifier as follows:			
a. CHANNEL 1 to 5 MV/MM			
b. CHANNEL 4 to 10 MV/MM			
c. CHANNEL 5 to 50 MV/MM.			
39. Set the chart speed to 1 on the Oscillograph Control panel and set CHART DRIVE to MM/SEC.			
40. Perform the following DSKY operations:			
VERB 42	ENTR		
VERB 33	ENTR		
41. Measure and record the oscilloscope indications of A through E as represented on figure 1.			
42. When the Inner Gimbal Indication on the Gimbal Position Control panel appears to stop, stop the Oscillograph and record the			

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JOB GIMBAL RESPONSE TEST			JDC 12619 REV C PAGE 6 OF 10
SUBSYSTEM LEM G & N SYSTEM		ASSY	
b. MG TM Current on CHANNEL 4			
c. MG CDU Coarse Error on CHANNEL 5.			
48. Insure that CH2AC, CH4DC and CH5AC pushbuttons on the Oscillograph Signal Selector panel are lighted.			
49. Set the sensitivities on the Oscillograph Amplifiers as follows:			
a. CHANNEL 2 to 5 MV/MM			
b. CHANNEL 4 to 10 MV/MM			
c. CHANNEL 5 to 50 MV/MM			
50. Set the chart speed to 1 on the Oscillograph Control panel and set CHART SPEED to MM/SEC.			
51. Perform the following DSKY operations:			
VERB 42	ENTR		
VERB 33	ENTR		
NOTE: Perform step 52 as quickly as possible as measurement time is limited to approximately 4 minutes. If measurement cannot be completed before pulse torquing ends turn the oscillograph off and repeat steps 43 and 51 and complete measurements not taken.			
52. Measure and record the oscilloscope indication of A through E as represented on figure 1.			
53. When the Middle Gimbal Indicator on the Gimbal Position Control panel appears to stop, stop the Oscillograph. Set all sensitivities on the Oscillograph to OFF.			

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JOB GIMBAL RESPONSE TEST			JDC 12619 REV C PAGE 7 OF 10
SUBSYSTEM LEM G & N SYSTEM		ASSY	
NOTE: Perform step 59 as quickly as possible as measurement time is limited to approximately 2 minutes. If measurement cannot be completed before pulse torquing ends turn the oscillograph off and repeat steps 54 and 58 and complete measurements not taken.			
59. Measure and record the oscilloscope indications of A through E as represented in figure 1.			
60. When the Middle Gimbal Indication on the Gimbal Position Control panel appears to stop, stop the Oscillograph and record the maximum amplitude (neglect spikes) of CHANNEL 2, 4 and 5 on the data sheets. Set all sensitivities on the Oscillograph Amplifier to OFF.			
61. Remove all jumper cables placed during this procedure.			
62. Perform the following DSKY operations:			
VERB 41	NOUN 20	ENTR	
VERB 21	NOUN 22	Flashing	
+00000	ENTR	ENTR	
VERB 22	NOUN 22	Flashing	
+00000	ENTR	ENTR	
VERB 23	NOUN 22	Flashing	
+00000	ENTR	ENTR	
VERB 41	NOUN 22	Displayed	
63. Set the following controls on the Oscillograph Signal Selector panel to monitor the associated signals:			
CHANNEL Position	Signal		
a. 1-2	IG & Y Gyro Error Signal		
b. 2-2	MG Error Signal		
c. 3-2	OG Error Signal		
64. Insure that CH3AC pushbutton on the Oscillograph Signal Selector panel is lit.			
65. Press the CHART SPEEDS 200 pushbutton on the Oscillograph Control panel and set the following channel sensitivities on the Oscillograph Amplifier panel:			
Channel	Sensitivity		
a. 1	50 MV/MM		
b. 2	10 MV/MM		
c. 3	10 MV/MM		
66. Set the PHASE SHIFT SELECTOR on the phase sensitive Demodulators of CHANNELS 1, 2 and 3 to 3200 ~ 0 deg.			
IG STEP RESPONSE			
67. Connect a jumper between:			
TPA #2	TB 5-27 and TB 2-11		
68. Perform the following DSKY operations:			
a. VERB 41	NOUN 20	ENTR	
b. Observe	VERB 21	ENTR	

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JOB GIMBAL RESPONSE TEST			JDC 12619 REV C PAGE 8 OF 10
SUBSYSTEM LEM G & N SYSTEM		ASSY	
c. +00000	ENTR		
d. Observe	VERB 22	NOUN 22	Flashing
e. +00000	ENTR		
f. Observe	VERB 23	NOUN 22	Flashing
g. +00000	ENTR		
h. Observe	VERB 41	NOUN 22	Displayed
i. VERB 36	ENTR		
69. Start the Oscillograph by setting the CHART DRIVE switch to MM/SEC.			
70. Set and hold the SERVO TEST switch on the TPA #2 in the up position.			
71. After a constant servo error is observed on CHANNEL 1 of the Oscillograph, release the SERVO TEST switch on TPA #2.			
72. After a constant servo error is observed on CHANNEL 1 of the Oscillograph, stop the Oscillograph.			
73. Record the IG stabilization loop response time on CHANNEL 1 of the Oscillograph Chart by measuring the time interval between releasing the SERVO TEST switch and the peak magnitude of the first overshoots after the initial disturbance.			
MG STEP RESPONSE			
74. Set the following Channel sensitivities on the Oscillograph Amplifier panel:			
Channel	Sensitivity		
a. 1	10 MV/MM		
b. 2	50 MV/MM		
c. 3	10 MV/MM		
75. Remove the jumper of step 67 and connect as follows:			
TPA #2	TP 5-18 and TB 2-10		
76. Perform the following DSKY operations:			
a. VERB 41	NOUN 20	ENTR	
b. Observe	VERB 21	NOUN 22	Flashing
c. +00000	ENTR		
d. Observe	VERB 22	NOUN 22	Flashing
e. +00000	ENTR		
f. Observe	VERB 23	NOUN 22	Flashing
g. +00000	ENTR		
h. Observe	VERB 41	NOUN 22	Displayed
i. VERB 36	ENTR		
77. Set and hold the SERVO TEST switch on the TPA #2 in the up position.			
78. After a constant servo error is observed on CHANNEL 2 of the Oscillograph, release the SERVO TEST switch on the TPA #2.			
79. After a constant servo error is observed on CHANNEL 2 of the Oscillograph, stop the Oscillograph.			
80. Record the MG stabilization loop response time on CHANNEL 2 of the Oscillograph Chart by measuring the time interval between releasing the SERVO TEST switch and the peak magnitude of the first overshoots after the initial disturbance.			

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SUBSYSTEM LEM G & N SYSTEM  
DESCRIPTION A gimbal friction test is performed by driving the Outer and Inner gimbals through plus and minus 360°, one at a time, and the Middle gimbal through 135°. During the slow periods the Fine and Coarse CDU errors and gimbal torque motor current are monitored on the Oscillograph. In addition the plus and minus Δθ abort signal characteristics are checked during each gimbal slew. After the gimbal friction test the OG, MG and IG stab loop responses are tested by providing a step input to each DC Stab Amp.

Rev.	Let.	Date	TDR	PAGES REVISED	APPROVAL	REFERENCES
			JDC	D.S.	MM	PS 6015000
1	A	7-5-66	30046	1-7	2	MM
2	B	7-21-66	30273	2	2	MM
3	C	8-5-66	30522	2,4,5-9	1	EA
4	D	8-18-66	30702	-	1	EA
5	E	11-10-66	31903	2,3	-	EA
6	F	12-27	32605	2	1	EA
						TOOLS AND MATERIAL

- IMPORTANT: 1. All started (\*\*) parameters on the Data Sheet must be corrected by the multiplication factor found on the signal identification drawings to obtain the true value.
2. The OSCILLOGRAPH sensitivities called out in this JDC are initial values. Operators may change sensitivities as required for optimum resolution.
- INITIALIZATION
1. Establish a MASTER INITIALIZATION condition.
2. (Deleted).
3. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 173.
4. Measure the 28 VDC Bus voltage indicated on the DVM. Record the indication.
5. Insure that the Inner, Middle and Outer gimbals are set to approximately 0.0° as indicated on the Gimbal Position Control panel. If not, perform the following DSKY operations:
- a. VERB 41 NOUN 20 ENTR
- b. Observe VERB 21 NOUN 22 Flashing ENTR
- c. +00000
- d. Observe VERB 22 NOUN 22 Flashing ENTR
- e. +00000

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FORM 00143  
Chg. 7-23-65

SUBSYSTEM LEM G & N SYSTEM

ASSY

OG FRICTION TEST

18. Perform the following DSKY operations:

- a. VERB 41 NOUN 20 ENTR
- b. VERB 21 NOUN 22 Flashing ENTR
- c. +00000
- d. VERB 22 NOUN 22 Flashing ENTR
- e. +00000
- f. VERB 23 NOUN 22 Flashing ENTR
- g. +00000
- h. VERB 41 NOUN 22 Displayed ENTR
- i. VERB 24 NOUN 01 ENTR
- j. 00403
- k. VERB 21 NOUN 01 Flashing ENTR
- l. 40000
- m. VERB 22 NOUN 01 Flashing ENTR
- n. 40077
19. Remove jumper from J2-F of the Auxiliary Input panel and place it on J2-E to monitor OG - Δθ abort signal on the oscilloscope.
20. Set the sensitivities on the Oscillograph Amplifier as follows:
- a. CHANNEL 3 to 5 MV/MM
- b. CHANNEL 4 to 10 MV/MM
- c. CHANNEL 5 to 50 MV/MM.
21. Set the chart speed to 1 on the Oscillograph Control panel and set CHART DRIVE to MM/SEC.
22. Perform the following DSKY operations:
- a. Scope Indications A through E (figure 1)

- b. IRIG FVR (PIPA & IRIG SF MONITOR Selector switch on TPA #1 to position 10) on the Current Source Monitor per JDC 18016
- c. IRIG Torque Current Monitor (PIPA & IRIG SF MONITOR Selector switch on TPA #1 to position 11) on the Current Source Monitor per JDC 18016
- d. IRIG Scale Factor (PIPA & IRIG SF MONITOR Selector switch on TPA #1 to position 12) on the Current Source Monitor per JDC 18016.
17. When the Outer Gimbal Indicator on the Gimbal Position Control panel appears to stop, stop the Oscillograph. Set all sensitivities on the Oscillograph to OFF.

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FORM 00144  
Chg. 7-23-65

SUBSYSTEM LEM G & N SYSTEM

ASSY

OG FRICTION TEST

1. Observe VERB 23 NOUN 22 Flashing ENTR
- g. +00000
- h. Observe VERB 41 NOUN 22 Displayed ENTR
1. VERB 36
9. Place jumpers between the following points:
- GSE From To
- A1P DIRECT PROBES CHADC
- A1P OUTPUT
- A1P BUFFERED PROBES CH5AC
- A1P OUTPUT
- A1P J2F (OG-Δθ Abort) SCOPE A IN
- TPA#2 DIRECT PROBE TB1-45 (h) 49 (lo)
- TPA#2 BUFFERED PROBE TB2-35 (h) 18 (lo)
10. Set SCOPE "A" INPUT to AUX on the Primary Signal Selector panel. Set DIFF amp to ON on the Dual Beam Oscilloscope.
11. Set CHANNEL 3 on Oscillograph Signal Selector panel to 5 and CHANNEL 4 and 5 to AUX and monitor the following signals:
- a. OG CDU Fine Error on CHANNEL 3
- b. OG CDU current on CHANNEL 4
- c. OG CDU Coarse Error on CHANNEL 5.
12. Insure that CH3AC, CHADC and CH5AC pushbuttons on the Oscillograph Signal Selector panel are lighted.
13. Set the sensitivities on the Oscillograph Amplifier as follows:
- a. CHANNEL 3 to 5 MV/MM

STATIC LOOP PARAMETERS

6. Set the Primary Signal Selector panel to monitor the following signals on the PVM. Record the in-phase voltage of each:

CROSSBAR CONTROL

Voltage

133

134

135

233

234

7. Set the Primary Signal Selector panel to monitor the following signals on the PVM. Record the total value of each:

CROSSBAR CONTROL

Voltage

136

137

138

OG FRICTION

8. Perform the following DSKY operations:

a. VERB 41 NOUN 20 ENTR

b. VERB 21 NOUN 22 Flashing ENTR

c. +00000

d. VERB 22 NOUN 22 Flashing ENTR

e. +00000

f. VERB 23 NOUN 22 Flashing ENTR

g. +00000

h. VERB 41 NOUN 22 Displayed

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SUBSYSTEM LEM G & N SYSTEM

ASSY

OG FRICTION TEST

23. Measure and record the oscilloscope indication of A through E as represented on figure 1.

24. When the Outer Gimbal Indicator on the Gimbal Position Control panel appears to stop, stop the Oscillograph and record the maximum amplitude (neglect spikes) of CHANNELS 3, 4, and 5 on the data sheets. Set all sensitivities on the Oscillograph Amplifiers to OFF.

OG FRICTION TEST

25. Perform the following DSKY operations:

a. VERB 41 NOUN 20 ENTR

b. VERB 21 NOUN 22 Flashing ENTR

c. +00000

d. VERB 22 NOUN 22 Flashing ENTR

e. +00000

f. VERB 23 NOUN 22 Flashing ENTR

g. +00000

h. VERB 41 NOUN 22 Displayed ENTR

i. VERB 24 NOUN 01 ENTR

j. 00405

k. VERB 21 NOUN 01 Flashing ENTR

l. 37777

m. VERB 22 NOUN 01 Flashing ENTR

n. 37743

26. Remove the jumper from J2-E of Auxiliary Input panel and place it on J2-B to monitor IG - Δθ abort signal on the scope.

27. Remove the jumper from TB1 45 of TPA #2 and place it on TB 2-31 of TPA #2.

28. Remove the jumper TB 2-35 and place it on TB 2-47 of TPA #2.

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**SUBSYSTEM LEM G & N SYSTEM**  
DESCRIPTION: A gimbal friction test is performed by driving the Outer and Inner gimbals through plus and minus 360°, one at a time, and the Middle gimbal through 135°. During the slow periods the Fine and Coarse CDU errors and gimbal torque motor current are monitored on the Oscilloscope. In addition the plus and minus Δθ short signal characteristics are checked during each gimbal slew. After the gimbal friction test the OG, MG and IG stab loop responses are tested by providing a step input to each DC Stab Amp.

Rev. Let.	Date	TORR NO.	PAGES REVISED	APPROVAL	REFERENCES
A	7-5-66	30046	1-7	2	PS 6015000
B	7-21-66	30273	2	2	MM/21 ACMA
C	8-5-66	30522	2,4,6-9	1	EA 21 MBH
D	8-18-66	30702	-	1	EA 21 -
E	11-10-66	31903	2,3	-	EA 21 -
F	1-12-67	32605	2	-	EA 21 -
					TOOLS AND MATERIAL

**IMPORTANT: 1.** All started (\*) parameters on the Data Sheet must be corrected by the multiplication factor found on the signal identification drawings to obtain the true value.  
**2.** The OSCILLOGRAPH sensitivities called out in this JDC are initial values. Operators may change sensitivities as required for optimum resolution.

**INITIALIZATION**  
1. Establish a MASTER INITIALIZATION condition.

2. (Deleted).
3. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 173.
4. Measure the 28 VDC Bus voltage indicated on the DVM. Record the indication.
5. Insure that the Inner, Middle and Outer gimbals are set to approximately 0.0° as indicated on the Gimbal Position Control panel. If not, perform the following DSKY operations:
- a. VERB 41 NOUN 20 ENTR
  - b. Observe VERB 21 NOUN 22 Flashing ENTR
  - c. +00000
  - d. Observe VERB 22 NOUN 22 Flashing ENTR
  - e. +00000

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ASSY

- b. CHANNEL 4 to 10 MV/MM  
c. CHANNEL 5 to 50 MV/MM.

14. Set the chart speed to 1 on the Oscillograph Control panel and set CHART DRIVE to MM/SEC.

15. Perform the following DSKY operations:

- VERB 42 ENTR
- VERB 33 ENTR

NOTE: If the measurements in step 16 cannot be completed before pulse torquing ends, turn the Oscilloscope off and repeat steps 8 and 15 and complete measurements not taken.

16. Measure and record the following signals:

- a. Scope Indications A through E (figure 1)
- b. IRIG FVR (PIPA & IRIG SF MONITOR Selector switch on TPA #1 to position 10) on the Current Source Monitor per JDC 18016
- c. IRIG Torque Current Monitor (PIPA & IRIG SF MONITOR Selector switch on TPA #1 to position 11) on the Current Source Monitor per JDC 18016
- d. IRIG Scale Factor (PIPA & IRIG SF MONITOR Selector switch on TPA #1 to position 12) on the Current Source Monitor per JDC 18016.

17. When the Outer Gimbal Indicator on the Gimbal Position Control panel appears to stop, stop the Oscilloscope. Set all sensitivities on the Oscilloscope to OFF.

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SUBSYSTEM LEM G & N SYSTEM

ASSY

- f. Observe VERB 23 NOUN 22 Flashing ENTR
  - g. +00000
  - h. Observe VERB 41 NOUN 22 Displayed ENTR
  - i. VERB 36
- STATIC LOOP PARAMETERS**
6. Set the Primary Signal Selector panel to monitor the following signals on the PVM. Record the in-phase voltage of each:

Voltage

- a. OG Error Signal 133
- b. MG Error Signal 134
- c. IG Error Signal 135
- d. X Gyro Error Signal 233
- e. Z Gyro Error Signal 234

7. Set the Primary Signal Selector panel to monitor the following signals on the PVM. Record the total value of each:

Voltage

- a. OG TDA 136
- b. MG TDA 137
- c. IG TDA 138

**-OG FRICTION**

8. Perform the following DSKY operations:

- a. VERB 41 NOUN 20 ENTR
- b. VERB 21 NOUN 22 Flashing ENTR
- c. +00000
- d. VERB 22 NOUN 22 Flashing ENTR
- e. +00000
- f. VERB 23 NOUN 22 Flashing ENTR
- g. +00000
- h. VERB 41 NOUN 22 Displayed

CROSSBAR CONTROL

- 136
- 137
- 138

10. Set SCOPE "A" INPUT to AUX on the Primary Signal Selector panel. Set DIFF amp to ON on the Dual Beam Oscilloscope.

11. Set CHANNEL 3 on Oscilloscope Signal Selector panel to 5 and CHANNEL 4 and 5 to AUX and monitor the following signals:

- a. OG CDU Fine Error on CHANNEL 3
- b. OG TM current on CHANNEL 4
- c. OG CDU Coarse Error on CHANNEL 5.
- 12. Insure that CHSAC, CHADC and CH5AC pushbuttons on the Oscilloscope Signal Selector panel are lighted.
- 13. Set the sensitivities on the Oscilloscope Amplifier as follows:
  - a. CHANNEL 3 to 5 MV/MM

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23. Measure and record the oscilloscope indication of A through E as represented on figure 1.

24. When the Outer Gimbal Indicator on the Gimbal Position Control panel appears to stop, stop the Oscilloscope and record the maximum amplitude (neglect spikes) of CHANNELS 3, 4, and 5 on the data sheets. Set all sensitivities on the Oscilloscope Amplifiers to OFF.

**-IG FRICTION TEST**

25. Perform the following DSKY operations:

- a. VERB 41 NOUN 20 ENTR
- b. VERB 21 NOUN 22 Flashing ENTR
- c. +00000
- d. VERB 22 NOUN 22 Flashing ENTR
- e. +00000
- f. VERB 23 NOUN 22 Flashing ENTR
- g. +00000
- h. VERB 41 NOUN 22 Displayed
- i. VERB 24 NOUN 01 ENTR
- j. 00405
- k. VERB 21 NOUN 01 Flashing
- l. 37777
- m. VERB 22 NOUN 01 Flashing
- n. 37743

26. Remove the jumper from J2-E of Auxiliary Input panel and place it on J2-B to monitor IG -Δθ abort signal on the scope.

27. Remove the jumper from TB1 45 of TPA #2 and place it on TB 2-31 of TPA #2.

28. Remove the jumper TB 2-35 and place it on TB 2-47 of TPA #2.

29. Set CHANNEL 1 on the Oscilloscope Signal Selector panel to 5 and CHANNEL 4 and 5 to AUX and monitor the following signals:

- a. IG CDU Fine Error on CHANNEL 1
- b. IG TM Current on CHANNEL 4
- c. IG CDU Coarse Error on CHANNEL 5.
- 30. Insure that CH1AC, CHADC and CH5AC pushbuttons on the Oscilloscope Signal Selector panel are lighted.
- 31. Set the sensitivities on the Oscilloscope Amplifier as follows:
  - a. CHANNEL 1 to 5 MV/MM
  - b. CHANNEL 4 to 10 MV/MM
  - c. CHANNEL 5 to 50 MV/MM
- 32. Set the chart speed to 1 on the Oscillograph Control panel and set CHART DRIVE to MM/SEC.
- 33. Perform the following DSKY operations:
  - VERB 42 ENTR
  - VERB 33 ENTR
- 34. Measure and record the oscilloscope indications of A through E as represented on figure 1.
- 35. When the Inner Gimbal Indicator on the Gimbal Position Control panel appears to stop, stop the Oscilloscope. Set all sensitivities on the Oscilloscope to OFF.
- 36. Perform the following DSKY operations:
  - a. VERB 41 NOUN 20 ENTR
  - b. VERB 21 NOUN 22 Flashing









ASSY

OG STEP RESPONSE

81. Set the following channel Sensi-  
tivities on the Oscillograph Amplifier panel:

- | Channel | Sensitivity |
|---------|-------------|
| 1       | 10 MV/MM    |
| 2       | 10 MV/MM    |
| 3       | 50 MV/MM    |

82. Remove the jumper of step 76 and  
connect as follows:

- TPA #2 TB 5-18 and  
TPA #2 TB 2.4

83. Perform the following DSKY operations:

- a. VERB 41 NOUN 20 ENTR

b. Observe VERB 21 NOUN 22 Flashing

c. +00000 VERB 21 NOUN 22 Flashing

d. Observe VERB 22 NOUN 22 Flashing

e. +00000 VERB 22 NOUN 22 Flashing

f. Observe VERB 23 NOUN 22 Flashing

g. +00000 VERB 23 NOUN 22 Flashing

h. Observe VERB 41 NOUN 22 Displayed

i. VERB 36 VERB 36

84. Set and hold the SERVO TEST switch  
on the TPA #2 in the up position.

85. After a constant servo error is ob-  
served on CHANNEL 3 of the Oscillograph,

release the SERVO TEST switch on the TPA #2.

86. After a constant servo error is ob-  
served on CHANNEL 3 of the Oscillograph,

stop the Oscillograph.

87. Record the OG stabilization loop  
response time on CHANNEL 3 of the

Oscillograph Chart by measuring the time  
interval between releasing the SERVO TEST  
switch and the peak magnitude of the first  
overshoot. In addition, record the number of  
overshoots after the initial disturbance.

NORMALIZATION OF SYSTEM

88. Perform the following DSKY  
operation:

- a. VERB 36 ENTR

89. Perform the following DSKY oper-  
ations:

- a. VERB 41 NOUN 20 ENTR

b. Observe VERB 21 NOUN 22 Flashing

c. +00000 VERB 21 NOUN 22 Flashing

d. Observe VERB 22 NOUN 22 Flashing

e. +00000 VERB 22 NOUN 22 Flashing

f. Observe VERB 23 NOUN 22 Flashing

g. +00000 VERB 23 NOUN 22 Flashing

ASSY

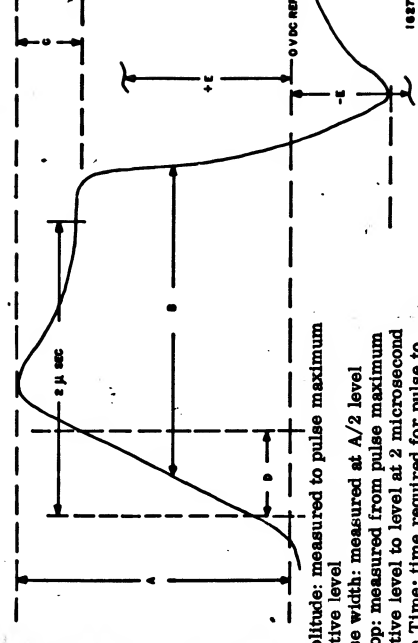


Figure 1. Waveform Description

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APOLLO 68N  
EQUIPMENT TEST  
DATA SHEET 1 OF 4

JOB GIMBAL RESPONSE TEST

JDC  
NO. 12619  
REV. F  
INITIAL TDR

ASSEMBLY UNDER TEST				TEST HISTORY			
TITLE _____		DATE _____		START _____		END _____	
SER. NO. _____	DWG _____	REV. _____	TIME _____	START _____	END _____	TOTAL ELAPSED _____	
MAJOR GROUND SUPPORT EQUIPMENT							
NAME _____		SER. NO. _____		CAL. DATE _____		CAL. DATE _____	
NAME _____		SER. NO. _____		CAL. DATE _____		CAL. DATE _____	
CONDUCTED BY _____		NAME/AFFILIATION _____		APPROVED BY _____		NAME/AFFILIATION _____	

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ ACC
4	28 VDC Bus voltage	vdc	27.75		28.25	
6.a	OG Error signal	mv			60	
6.b	MG Error signal	mv			60	
6.c	IG Error signal	mv			60	
6.d	X Gyro Error signal	mv			60	
6.e	Z Gyro Error signal	mv			60	
7.a	Total OG TDA	volts			10	
7.b	Total MG TDA	volts			10	
7.c	Total IG TDA	volts			10	
16	OG - Δθ abort	Refer to fig 1				
16.a.A	Amplitude	peak volts	4		10	
16.a.B	Pulse width	μsec	2		4	
16.a.C	Droop	volts			A 5	
16.a.D	Rise Time	μsec			0.5	

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APOLLO 68N  
EQUIPMENT TEST  
DATA SHEET 2 OF 4

JOB GIMBAL RESPONSE TEST

JDC  
NO. 12619  
REV. F

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ ACC
16.a.E	Noise with respect to 0 vdc reference	volts	-4.0		-4.0	
16.b	IRIG PVR	vdc	5.94		6.06	
16.c	IRIG Torque Current Monitor	vdc	1.000		1.12	
16.d	IRIG SF voltage	vdc	5.94		6.06	
23	OG + Δθ abort	Refer to fig 1				
23.A	Amplitude	peak volts	4		10	
23.B	Pulse width	μsec	2		4	
23.C	Droop	volts			A 5	
23.D	Rise Time	μsec			0.5	
23.E	Noise with respect to 0 vdc reference	volts	-4.0		-4.0	
24	OG CDU Fine Error on CH3	volt rms	-0.070		+0.070	
24	OG TM Current on CH4	vdc	-0.125		+0.125	
24	OG CDU Coarse Error on CH5	volt rms	-0.680		+0.680	
34	IG - Δθ abort	Refer to fig 1				
34.A	Amplitude	peak volts	4		10	
34.B	Pulse width	μsec	2		4	
34.C	Droop	volts			A 5	
34.D	Rise Time	μsec			0.5	

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FORM 00147  
Chg. 7-10-65

ASSY

OG STEP RESPONSE

81. Set the following channel Sensitivity on the Oscilloscope Amplifier panel:

- a. Channel 1 Sensitivity 10 MV/MM  
b. Channel 2 10 MV/MM  
c. Channel 3 50 MV/MM

82. Remove the jumper of step 75 and connect as follows:

- TPA #2 TB 6-18 and  
TPA #2 TB 2.4

83. Perform the following DSKY operations:

- a. VERB 41 NOUN 20 ENTR  
b. Observe VERB 21 NOUN 22 Flashing  
c. +00000 VERB 21 Flashing  
d. Observe VERB 22 ENTR

e. +00000 VERB 22 Flashing  
f. Observe VERB 23 ENTR

g. +00000 VERB 23 Flashing  
h. Observe VERB 36 ENTR

i. VERB 41 NOUN 22 Displayed  
j. VERB 36 ENTR

84. Set and hold the SERVO TEST switch on the TPA #2 in the up position.

85. After a constant servo error is observed on CHANNEL 3 of the Oscilloscope, release the SERVO TEST switch on the TPA #2.

86. After a constant servo error is observed on CHANNEL 3 of the Oscilloscope, stop the Oscilloscope.

87. Record the OG stabilization loop response time on CHANNEL 3 of the

Oscilloscope Chart by measuring the time interval between releasing the SERVO TEST switch and the peak magnitude of the first overshoot. In addition, record the number of overshoots after the initial disturbance.

NORMALIZATION OF SYSTEM

88. Perform the following DSKY operation:

- a. VERB 36 ENTR

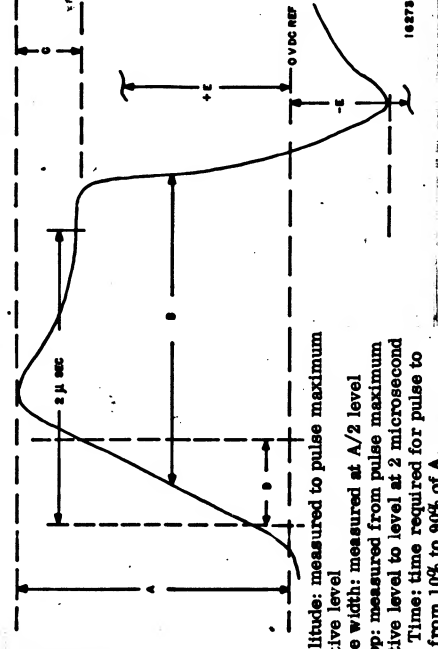
89. Perform the following DSKY operations:

- a. VERB 41 NOUN 20 ENTR  
b. Observe VERB 21 NOUN 22 Flashing  
c. +00000 VERB 21 Flashing  
d. Observe VERB 22 ENTR

e. +00000 VERB 22 Flashing  
f. Observe VERB 23 ENTR

g. +00000 VERB 23 Flashing  
h. Observe VERB 36 ENTR

ASSY



- A - Amplitude: measured to pulse maximum positive level  
B - Pulse width: measured at A/2 level  
C - Droop: measured from pulse maximum positive level to level at 2 microsecond rise from 10% to 90% of A.  
D - Rise Time: time required for pulse to rise from 10% to 90% of A.  
E - Noise: (No pulse)

Figure 1. Waveform Description

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APOLLO G&N  
EQUIPMENT TEST  
DATA SHEET 1 OF 4

JOB GIMBAL RESPONSE TEST

JDC  
NO. 12619  
REV. F  
INITIAL TDR

ASSEMBLY UNDER TEST		TEST HISTORY	
TITLE	DATE	START	END
SER. NO.	DWG	REV.	SITE / LOCATION
MAJOR GROUND SUPPORT EQUIPMENT			
CONDUCTED BY: NAME/AFFILIATION			
APPROVED BY: NAME/AFFILIATION			
NAME: SER. NO. CAL DATE			
NAME: SER. NO. CAL DATE			

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	RES	ACC
4	28 VDC Bus voltage	vdc	27.75		28.25		
6.a	OG Error signal	mv			60		
6.b	MG Error signal	mv			60		
6.c	IG Error signal	mv			60		
6.d	X Gyro Error signal	mv			60		
6.e	Z Gyro Error signal	mv			60		
7.a	Total OG TDA	volts			10		
7.b	Total MG TDA	volts			10		
7.c	Total IG TDA	volts			10		
16	OG - Δθ abort	Refer to fig 1					
16.a.A	Amplitude	peak volts	4		10		
16.a.B	Pulse width	μ sec	2		4		
16.a.C	Droop	volts			A/5		
13.a.D	Rise Time	μ sec			0.5		

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FORM 60146  
Chg. 7-13-65

APOLLO G&N  
EQUIPMENT TEST  
DATA SHEET 2 OF 4

JOB GIMBAL RESPONSE TEST

JDC  
NO. 12619  
REV. F

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	RES	ACC
16.a.E	Noise with respect to 0 vdc reference	volts	-4.0		+4.0		
16.b	IRIG PVR	vdc	5.94		6.06		
16.c	IRIG Torque Current Monitor	vdc	1.000		1.12		
16.d	IRIG SF voltage	vdc	5.94		6.06		
23	OG + Δθ short	Refer to fig 1					
23.A	Amplitude	peak volts	4		10		
23.B	Pulse width	μ sec	2		4		
23.C	Droop	volts			A/5		
23.D	Rise Time	μ sec			0.5		
23.E	Noise with respect to 0 vdc reference	volts	-4.0		+4.0		
24	OG CDU Fine Error on CH3	volt rms	-0.070		+0.070		
24	OG TM Current on CH4	vdc	-0.125		+0.125		
24	OG CDU Coarse Error on CH5	volt rms	-0.680		+0.680		
34	IG - Δθ abort	Refer to fig 1					
34.A	Amplitude	peak volts	4		10		
34.B	Pulse width	μ sec	2		4		
34.C	Droop	volts			A/5		
34.D	Rise Time	μ sec			0.5		

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FORM 60146  
Chg. 7-13-65

APOLLO GBN  
EQUIPMENT TEST  
DATA SHEET 3 OF 4

JJC  
NO. 12619  
REV. F

JOB GIMBAL RESPONSE TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ ACC
34.E	Noise with respect to 0 vdc reference	volts	-4.0		+4.0	
41	IG + $\Delta\theta$ abort	Refer to fig 1				
41.A	Amplitude	peak volts	4		10	
41.B	Pulse width	$\mu$ sec	2			
41.C	Droop	volts			4	
41.D	Rise Time	$\mu$ sec			$\frac{A}{5}$	
41.E	Noise with respect to 0 vdc reference	volts	-4.0		0.5	
42	IG CDU Fine Error on CH1	volt rms	-0.070		+0.070	
42	IG TM Current on CH4	vdc	-0.125		+0.125	
42	IG CDU Coarse Error on CH5	volt rms	-0.680		+0.680	
52	MG - $\Delta\theta$ abort	Refer to fig 1				
52.A	Amplitude	peak volts	4		10	
52.B	Pulse width	$\mu$ sec	2		4	
52.C	Droop	volts			$\frac{A}{5}$	
52.D	Rise Time	$\mu$ sec			0.5	
52.E	Noise with respect to 0 vdc reference	volts	-4.0		+4.0	
59	MG + $\Delta\theta$ abort	Refer to fig 1				

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APOLLO GBN  
EQUIPMENT TEST  
DATA SHEET 4 OF 4

JJC  
NO. 12619  
REV. F

JOB GIMBAL RESPONSE TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ ACC
59.A	Amplitude	peak volts	4		10	
59.B	Pulse width	$\mu$ sec	2		4	
59.C	Droop	volts			$\frac{A}{5}$	
59.D	Rise Time	$\mu$ sec			0.5	
59.E	Noise with respect to 0 vdc reference	volts	-4.0		+4.0	
60	MG CDU Fine Error on CH2	volt rms	-0.070		+0.070	
60	MG TM Current on CH4	vdc	-0.125		+0.125	
60	MG CDU Coarse Error on CH5	volt rms	-0.680		+0.680	
73	IG stabilization loop response	sec	0		0.8	
	Number of over- shoots	number	0		2	
80	MG stabilization loop response	sec	0		0.8	
	Number of over- shoots	number	0		2	
87	OG stabilization loop response	sec	0		0.8	
	Number of over- shoots	number	0		2	
	AGC Displays	All DSKY displays and indications reacted as specified				

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APOLLO G&N  
EQUIPMENT TEST  
DATA SHEET 3 OF 4

JDC  
NO. 12-119  
REV. F

JOB GIMBAL RESPONSE TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ ACC
34.E	Noise with respect to 0 vdc reference	volts	-4.0		+4.0	
41	IG + Δθ abort	Refer to fig 1				
41.A	Amplitude	peak volts	4		10	
41.B	Pulse width	μsec	2		4	
41.C	Droop	volts			A 5	
41.D	Rise Time	μsec			0.5	
41.E	Noise with respect to 0 vdc reference	volts	-4.0		+4.0	
42	IG CDU Fine Error on CH1	volt rms	-0.070		+0.070	
42	IG TM Current on CH4	vdc	-0.125		+0.125	
42	IG CDU Coarse Error on CH5	volt rms	-0.680		+0.680	
52	MG -Δθ abort	Refer to fig 1				
52.A	Amplitude	peak volts	4		10	
52.B	Pulse width	μsec	2		4	
52.C	Droop	volts			A 5	
52.D	Rise Time	μsec			0.5	
52.E	Noise with respect to 0 vdc reference	volts	-4.0		+4.0	
59	MG + Δθ abort	Refer to fig 1				

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FORM 10117  
C 7-23-65

APOLLO G&N  
EQUIPMENT TEST  
DATA SHEET 4 OF 4

JDC  
NO. 12619  
REV. F

JOB GIMBAL RESPONSE TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ ACC
59.A	Amplitude	peak volts	4		10	
59.B	Pulse width	μsec	2		4	
59.C	Droop	volts			A 5	
59.D	Rise Time	μsec			0.5	
59.E	Noise with respect to 0 vdc reference	volts	-4.0		+4.0	
60	MG CDU Fine Error on CH2	volt rms	-0.070		+0.070	
60	MG TM Current on CH4	vdc	-0.125		+0.125	
60	MG CDU Coarse Error on CH5	volt rms	-0.680		+0.680	
73	IG stabilization loop response	sec	0		0.8	
80	Number of over- shoots	number	0		2	
80	MG stabilization loop response	sec	0		0.8	
87	OG stabilization loop response	sec	0		0.8	
87	Number of over- shoots	number	0		2	
	AGC Displays	All DSKY displays and indications reacted as specified				

DATE 15 MAR 66

FORM 0011  
C 7-23-65

JOB GIMBAL RESPONSE TEST

**SUBSYSTEM LEM G & N SYSTEM**  
**DESCRIPTION** A gimbal friction test is performed by driving the Outer and Inner gimbals through plus and minus 360°, one at a time, and the Middle gimbal through 135°. During the slow periods the Fine and Coarse CDU errors and gimbal torque motor current are monitored on the Oscillograph. In addition the plus and minus Δθ abort signal charact risks are checked during each gimbal slew. After the gimbal friction test the OG, MG and IG stab loop responses are tested by providing a step input to each DC Stab Amp.

Rev.	Date	TDRR NO.	PAGES REVISED	APPROVAL	REFERENCES
1	7-5-66	30046	1-7	M/T	PS 6015000
2	7-21-66	30273	2	M/T	ACM
3	8-5-66	30522	2,4,6-9	EA	MB
4	8-18-66	30702	1	EA	IMPORTANT
5	11-10-66	31903	2,3	EA	INTERVAL
6	1-12-67	32605	2	EA	INTERVAL
7	1-18-67	32668	2	EA	INTERVAL
8	2-2-67	32889	All	EA	TOOLS AND MATERIAL

**INITIALIZATION**

1. Perform JDC 12613 to establish a Master Initialization condition.
2. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 173.
3. Measure the 28 VDC Bus voltage indicated on the DVM. Record the indication.
4. Insure that the Inner, Middle and Outer gimbals are set to approximately 0.0° as

Indicated on the Gimbal Position Control panel. If not, perform the following DSKY operations:

- a. VERB 41 NOUN 20 ENTR
- b. Observe VERB 21 NOUN 22 Flashing ENTR
- c. +00000
- d. Observe VERB 22 NOUN 22 Flashing ENTR
- e. +00000

VERIFICATION WITH SID REQUIRED BEFORE USE  
DATE 15 MAR 66

JOB GIMBAL RESPONSE TEST

SUBSYSTEM LEM G & N SYSTEM

ASSY

- f. VERB 23 NOUN 22 Flashing
- g. +00000 ENTR
- h. VERB 41 NOUN 22 Displayed
- i. VERB 24 NOUN 01 ENTR
- j. 00403
- k. VERB 21 NOUN 01 Flashing
- l. 37777 ENTR
- m. VERB 22 NOUN 01 Flashing
- n. 37743 ENTR

9. Place jumpers between the following points:

- a. GSE From To
- b. AIP DIRECT PROBES CHADC
- c. AIP OUTPUT
- d. AIP BUFFERED PROBES CHSAC
- e. AIP OUTPUT
- f. J2F (OG-Δθ Abort) J1-A (Scope B CH1 Input)
- g. J4-F (coax jumper) SCOPE A
- h. TRIGGER IN, (In AIP)
- i. TPA #2 DIRECT PROBE TBI-45
- j. (M) 49 (to) TBI-35
- k. (M) 18 (to) TBI-6 (Blu)
- l. TBI-9 (Blk)

10. Deleted.

11. Set CHANNEL 3 on Oscillograph Signal Selector panel to 5 and CHANNEL 4 and 5 to AUX and monitor the following signals:

- a. OG CDU Fine Error on CHANNEL 3
- b. OG TM current on CHANNEL 4
- c. OG CDU Coarse Error on CHANNEL 5.

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ASSY

12. Insure that CHSAC, CHADC and CHSAC pushbuttons on the Oscillograph Signal Selector panel are lighted. Insure that the PHASE SHIFT SELECTOR switches on the Oscillograph Phase Sensitive Demodulators for CHANNELS 1, 2, 3, and 5 are set to the 800 ~ 0 DEG position and the FILTER switches are set to LO.
13. Set the sensitivities on the Oscillograph Amplifier as follows:
  - a. CHANNEL 3 to 5 MV/MM
  - b. CHANNEL 4 to 0.2 V/CM
  - c. CHANNEL 5 to 50 MV/MM.
14. Press CHART SPEEDS 1 pushbutton on the Oscillograph Control panel and set CHART DRIVE switch to MM/SEC.
15. Perform the following DSKY operations:
  - a. VERB 42 ENTR
  - b. VERB 33 ENTR

NOTE: If the measurements in step 16 cannot be completed before pulse torquing ends, turn the Oscillograph off and repeat steps 8 and 15 and complete measurements not taken.

16. Measure and record the following signals:

- a. Scope Indications A through E (Figure 3)

17. Remove jumper from J2-F of the Auxiliary Input panel and place it on J2-E to monitor OG + Δθ abort signal on the oscilloscope.

18. Set the sensitivities on the Oscillograph Amplifier as follows:

- a. CHANNEL 3 to 5 MV/MM

19. Perform the following DSKY operations:

- a. VERB 41 NOUN 20 ENTR
- b. VERB 21 NOUN 22 Flashing
- c. +00000 ENTR
- d. VERB 22 NOUN 22 Flashing
- e. +00000 ENTR
- f. VERB 23 NOUN 22 Flashing
- g. +00000 ENTR
- h. VERB 41 NOUN 22 Displayed
- i. VERB 24 NOUN 01 ENTR
- j. 00403 ENTR
- k. VERB 21 NOUN 01 Flashing
- l. 40000 ENTR
- m. VERB 22 NOUN 01 Flashing
- n. 40077 ENTR

20. Set the sensitivities on the Oscillograph Amplifier as follows:

- a. CHANNEL 3 to 5 MV/MM

JOB GIMBAL RESPONSE TEST

SUBSYSTEM LEM G & N SYSTEM

ASSY

-IG FRICTION TEST

25. Perform the following DSKY operations:

- a. VERB 41 NOUN 20 ENTR
- b. VERB 21 NOUN 22 Flashing
- c. +00000 ENTR
- d. VERB 22 NOUN 22 Flashing
- e. +00000 ENTR
- f. VERB 23 NOUN 22 Flashing
- g. +00000 ENTR
- h. VERB 41 NOUN 22 Displayed
- i. VERB 24 NOUN 01 ENTR
- j. 00405 ENTR
- k. VERB 21 NOUN 01 Flashing
- l. 37777 ENTR
- m. VERB 22 NOUN 01 Flashing
- n. 37743 ENTR

26. Remove the jumper from J2-E of Auxiliary Input panel and place it on J2-B to monitor IG - Δθ abort signal on the scope.

27. Remove the jumper from TBI 45 of TPA #2 and place it on TB 2-31 of TPA #2.

28. Remove the jumper TB 2-35 and place it on TB 2-47 of TPA #2.

29. Set CHANNEL 1 on the Oscillograph Signal Selector panel to 5 and CHANNEL 4 and 5 to AUX and monitor the following signals:

- a. IG CDU Fine Error on CHANNEL 1
- b. IG TM Current on CHANNEL 4
- c. IG CDU Coarse Error on CHANNEL 5.
- d. Insure that CHADC and CHSAC pushbuttons on the Oscillograph Signal Selector panel are lighted.

23. Measure and record the oscilloscope indication of A through E as represented on Figure 3.

24. When the Outer Gimbal Indicator on the Gimbal Position control panel appears to stop, stop the Oscillograph and record the maximum amplitude (neglect spikes) of CHANNELS 3 and 5. Using the equation given in Figure 1, calculate from the Oscillograph chart the maximum amplitude of CHANNEL 4. Record on data sheet. Set all sensitivities on the Oscillograph Amplifier to OFF.

Figure 1

Where 0.2 is the Oscillograph sensitivity in volts per centimeter,  $d_2$  is the deflection in centimeters measured from zero reference to the maximum peak deflection, and  $d_1$  is the deflection in centimeters measured from zero reference to the minimum peak deflection as shown above.

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SUBSYSTEM LEM G & N SYSTEM  
DESCRIPTION A gimbal friction test is performed by driving the Outer and Inner gimbals through plus and minus 360°, one at a time, and the Middle gimbal through 135°. During the slow periods the Fine and Coarse CDU errors and gimbal torque motor current are monitored on the Oscillograph. In addition the plus and minus Δθ abort signal characteristics are checked during each gimbal slew. After the gimbal friction test the OG, MG and IG stab loop responses are tested by providing a step input to each DC Stab Amp.

Rev.	Let.	Date	TORR NO.	PAGES REVISED	APPROVAL	REFERENCES
				JDC	D.S.	PS 6015000
A	7-5-66	30046	1-7	2	MM/2	NASH
B	7-21-66	30273	-	2	MM/2	ACMA
C	8-5-66	30522	2, 4, 6-9	1	EA/1	MEB
D	8-18-66	30702	-	1	EA/1	-
E	11-10-66	31903	2, 3	-	EA/1	-
F	1-12-67	32605	2	1	EA/1	-
G	1-18-67	32668	2	1	EA/1	-
H	2-2-67	32889	All	1, 4	EA/1	-
						TOOLS AND MATERIAL

#### INITIALIZATION

1. Perform JDC 12613 to establish a Master Initialization condition.
2. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 173.
3. Measure the 28 VDC Bus voltage indicated on the DVM. Record the indication.
4. Insure that the Inner, Middle and Outer gimbals are set to approximately 0.0° as

Indicated on the Gimbal Position Control panel. If not, perform the following DSKY operations:

- a. VERB 41 NOUN 20 ENTR
- b. Observe VERB 21 NOUN 22 Flashing ENTR
- c. +00000
- d. Observe VERB 22 NOUN 22 Flashing ENTR
- e. +00000

VERIFICATION WITH SIDL REQUIRED BEFORE USE

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- f. Observe VERB 23 NOUN 22 Flashing
- g. +00000 VERB 41 NOUN 22 Displayed
- h. Observe VERB 24 NOUN 01 ENTR
- i. VERB 41 NOUN 22 Displayed
- j. 00403 VERB 36 ENTR
- k. VERB 21 NOUN 01 Flashing
- l. 37777 VERB 22 NOUN 01 Flashing
- m. VERB 22 NOUN 01 ENTR
- n. 37743

#### 5. Perform the following DSKY operations:

- a. VERB 21 NOUN 01 ENTR
- b. 00370
- c. 16002

#### STATIC LOOP PARAMETERS

6. Set the Primary Signal Selector panel to monitor the following signals on the PAVM. Record the in-phase voltage of each:

Voltage

CROSSBAR CONTROL

- a. OG Error Signal 133
- b. MG Error Signal 134
- c. IG Error Signal 135
- d. X Gyro Error Signal 233
- e. Z Gyro Error Signal 234

#### 7. Set the Primary Signal Selector panel

to monitor the following signals on the PAVM.

Record the total value of each:

Voltage

CROSSBAR CONTROL

- a. OG TDA 136
- b. MG TDA 137
- c. IG TDA 138

#### 8. Perform the following DSKY operations:

- a. VERB 41 NOUN 20 ENTR
- b. VERB 21 NOUN 22 Flashing
- c. +00000 ENTR
- d. VERB 22 NOUN 22 Flashing
- e. +00000 ENTR

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Current Source Monitor per JDC 18016

- d. IRIG Scale Factor (PIPA & IRIG SF MONITOR) Selector switch on TPA #1 to position 12) on the

Current Source Monitor per JDC 18016.

17. When the Outer Gimbal Indicator on the Gimbal Position Control panel appears to stop, stop the Oscillograph. Set all sensitivities on the Oscillograph to OFF.

#### OG FRICTION TEST

18. Perform the following DSKY operations:

tions:

- a. VERB 41 NOUN 20 ENTR
- b. VERB 21 NOUN 22 Flashing
- c. +00000 ENTR
- d. VERB 22 NOUN 22 Flashing
- e. +00000 ENTR
- f. VERB 23 NOUN 22 Flashing
- g. +00000 ENTR
- h. VERB 41 NOUN 22 Displayed
- i. VERB 24 NOUN 01 ENTR
- j. 00403 ENTR
- k. VERB 21 NOUN 01 Flashing
- l. 40000 ENTR
- m. VERB 22 NOUN 01 Flashing
- n. 40077 ENTR

19. Remove jumper from J2-F of the Auxiliary Input panel and place it on J2-E to monitor OG + Δθ abort signal on the oscilloscope.

20. Set the sensitivities on the Oscillograph Amplifier as follows:

- a. CHANNEL 3 to 5 MV/MM

on TPA #1 to position 11) on the

CHART DRIVE switch to MM/SEC.

15. Perform the following DSKY operations:

tions:

- a. CHANNEL 3 to 5 MV/MM
- b. CHANNEL 4 to 0.2 V/CM
- c. CHANNEL 5 to 50 MV/MM.

14. Press CHART SPEEDS 1 pushbutton on the Oscillograph Control panel and set CHART DRIVE switch to MM/SEC.

NOTE: If the measurements in step 16 cannot be completed before pulse torquing ends, turn the Oscillograph off and repeat steps 8 and 15 and complete measurements not taken.

16. Measure and record the following signals:

- a. Scope Indications A through E (figure 3)
- b. IRIG PVR (PIPA & IRIG SF MONITOR) Selector switch on TPA #1 to position 10) on the Current Source Monitor per JDC 18016
- c. IRIG Torque Current Monitor (PIPA & IRIG SF MONITOR) Selector switch on TPA #1 to position 11) on the

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IG FRICTION TEST

25. Perform the following DSKY operations:

tions:

- a. VERB 41 NOUN 20 ENTR
- b. VERB 21 NOUN 22 Flashing
- c. +00000 ENTR
- d. VERB 22 NOUN 22 Flashing
- e. +00000 ENTR
- f. VERB 23 NOUN 22 Flashing
- g. +00000 ENTR
- h. VERB 41 NOUN 22 Displayed
- i. VERB 24 NOUN 01 ENTR
- j. 00405 ENTR
- k. VERB 21 NOUN 01 Flashing
- l. 37777 ENTR
- m. VERB 22 NOUN 01 Flashing
- n. 37743 ENTR

26. Remove the jumper from J2-E of Auxiliary Input panel and place it on J2-B to monitor IG - Δθ abort signal on the scope.

27. Remove the jumper from TBI 45 of TPA #2 and place it on TB 2-31 of TPA #2.

28. Remove the jumper TB 2-35 and place it on TB 2-47 of TPA #2.

29. Set CHANNEL 1 on the Oscillograph Signal Selector panel to 5 and CHANNEL 4 and 5 to AUX and monitor the following signals:

- a. IG CDU Fine Error on CHANNEL 1
- b. IG TM Current on CHANNEL 4
- c. IG CDU Coarse Error on CHANNEL 5.

30. Insure that CHADC and CH5AC pushbuttons on the Oscillograph Signal Selector panel are lighted.

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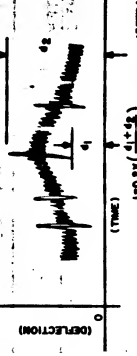


Figure 1

Where 0.2 is the Oscilloscope sensitivity in volts per centimeter,  $d_2$  is the deflection in centimeters measured from zero reference to the maximum peak deflection, and  $d_1$  is the deflection in centimeters measured from zero reference to the minimum peak deflection as shown above.



SUBSYSTEM	LEM G & N SYSTEM	ASSY
31. Set the sensitivities on the Oscillograph Amplifier as follows:		
a. CHANNEL 1 to 5 MV/MM		
b. CHANNEL 4 to 0.2 V/CM		
c. CHANNEL 5 to 50 MV/MM		
32. Press CHART SPEEDS 1 pushbutton on the Oscillograph Control panel and set CHART DRIVE switch to MM/SEC.		
33. Perform the following DSKY operations:		
VERB 42	ENTR	
VERB 33	ENTR	
34. Measure and record the oscilloscope indications of A through E as represented on Figure 3.		
35. When the Inner Gimbal Indicator on the Gimbal Position Control panel appears to stop, stop the Oscillograph. Set all sensitivities on the Oscillograph to OFF.		
+IG FRICTION TEST		
36. Perform the following DSKY operations:		
a. VERB 41	NOUN 20	ENTR
b. VERB 21	NOUN 22	Flashing
c. +00000	ENTR	
d. VERB 22	NOUN 22	Flashing
e. +00000	ENTR	
f. VERB 23	NOUN 22	Flashing
g. +00000	ENTR	
h. VERB 41	NOUN 22	Displayed
i. VERB 24	NOUN 01	ENTR
j. 00405	ENTR	
k. VERB 21	NOUN 01	Flashing
l. 40000	ENTR	
m. VERB 22	NOUN 01	Flashing
n. 40077	ENTR	

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SUBSYSTEM	LEM G & N SYSTEM	ASSY
f. VERB 23	NOUN 22	Flashing
g. +06750	ENTR	
h. VERB 41	NOUN 22	Displayed
i. VERB 24	NOUN 01	ENTR
j. 00407	ENTR	
k. VERB 21	NOUN 01	Flashing
l. 14000	ENTR	
m. VERB 23	NOUN 01	Flashing
n. 00000	ENTR	
44. Remove the jumper from J2-A of the Auxiliary Input panel and place it on J2-D to monitor MG - Δθ abort signal on the oscilloscope.		
45. Remove the jumper from TB 2-31 and place it on TB 2-32 of TPA #2.		
46. Remove the jumper from TB 2-47 and place it on TB 2-41 of TPA #2.		
47. Set CHANNEL 2 on the Oscillograph Signal Selector panel to 5 and CHANNEL 4 and 5 to AUX and monitor the following signals:		
a. MG CDU Fine Error on CHANNEL 2		
b. MG TM Current on CHANNEL 4		
c. MG CDU Coarse Error on CHANNEL 5.		
48. Insure that CH4DC and CH5AC pushbuttons on the Oscillograph Signal Selector panel are lighted.		
49. Set the sensitivities on the Oscillograph Amplifiers as follows:		
a. CHANNEL 2 to 5 MV/MM		
b. CHANNEL 4 to 0.2 V/CM		
c. CHANNEL 5 to 50 MV/MM		
50. Press CHART SPEEDS 1 pushbutton on the Oscillograph Control panel and set CHART SPEED switch to MM/SEC.		
1. 63777	NOUN 01	Flashing
	ENTR	

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SUBSYSTEM	LEM G & N SYSTEM	ASSY
m. VERB 22	NOUN 01	Flashing
n. 40000	ENTR	
55. Remove the jumper from J2-D of the Auxiliary Input panel and place it on J2-C to monitor MG + Δθ abort signal on the Oscilloscope.		
56. Set the sensitivities on the Oscillograph Amplifier as follows:		
a. CHANNEL 2 to 5 MV/MM		
b. CHANNEL 4 to 0.2 V/CM		
c. CHANNEL 5 to 50 MV/MM.		
57. Press CHART SPEEDS 1 pushbutton on the Oscillograph Control panel and set CHART SPEED switch to MM/SEC.		
58. Perform the following DSKY operations:		
VERB 42	ENTR	
VERB 33	ENTR	
NOTE: Perform step 59 as quickly as possible as measurement time is limited to approximately 2 minutes. If measurement cannot be completed before pulse torquing ends turn the oscillograph off and repeat steps 54 and 58 and complete measurements not taken.		
59. Measure and record the oscilloscope indications of A through E as represented in Figure 3.		
60. When the Middle Gimbal Indicator on the Gimbal Position Control panel appears to stop, stop the Oscillograph and record the maximum amplitude (neglect spikes) of CHANNELS 2 and 5 on the data sheets. Using		

the equation given in Figure 1, calculate from the Oscillograph chart the maximum amplitude of CHANNEL 4. Record on data sheet. Set all sensitivities on the Oscillograph Amplifiers to OFF.

61. Remove all jumper cables placed during this procedure.

62. Perform the following DSKY operations:

VERB 41 NOUN 20 ENTR

VERB 21 NOUN 22 Flashing

+00000 ENTR

VERB 22 NOUN 22 Flashing

+00000 ENTR

VERB 23 NOUN 22 Flashing

+00000 ENTR

VERB 41 NOUN 22 Displayed

63. Set the following controls on the Oscillograph Signal Selector panel to monitor the associated signals:

CHANNEL Position

a. 1-2

b. 2-2

c. 3-2

64. Insure that CH3AC pushbutton on the Oscillograph Signal Selector panel is lit.

65. Press the CHART SPEEDS 200 pushbutton on the Oscillograph Control panel and set the following channel sensitivities on the Oscillograph Amplifier panel:

Channel

a. 1

b. 2

Sensitivity

50 MV/MM

10 MV/MM

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c. 3	10 MV/MM	
66. Set the PHASE SHIFT SELECTOR on the Phase Sensitive Demodulators of CHANNELS 1, 2 and 3 to 3200 ~ 0 deg. Set FILTER switches to HL.		
IG STEP RESPONSE		
67. Apply the 10V step input to the IG TDA test input by connecting a jumper between TB5-27 of TPA #2 and TB2-11 of TPA #2.		
68. Perform the following DSKY operations:		
a. VERB 41	NOUN 20	ENTR
b. Observe	NOUN 22	Flashing
c. +00000	NOUN 22	ENTR
d. Observe	NOUN 22	Flashing
e. +00000	NOUN 22	ENTR
f. Observe	NOUN 22	Flashing
g. +00000	NOUN 22	ENTR
h. Observe	NOUN 22	Flashing
i. VERB 41	NOUN 22	Displayed
j. VERB 36	ENTR	
69. Start the Oscillograph by setting the CHART DRIVE switch to MM/SEC.		
70. Set and hold the SERVO TEST switch on the TPA #2 in the up position.		
71. After a constant servo error is observed on CHANNEL 1 of the Oscillograph, release the SERVO TEST switch on TPA #2.		
72. After a constant servo error is observed on CHANNEL 1 of the Oscillograph, stop the Oscillograph.		

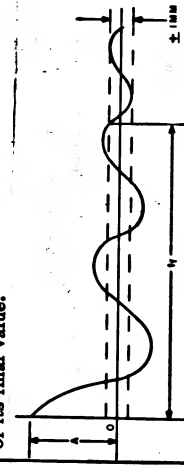


Figure 2

MG STEP RESPONSE

74. Set the following Channel sensitivities on the Oscillograph Amplifier panel:

Channel

a. 1

b. 2

c. 3

Sensitivity

10 MV/MM

20 MV/MM

10 MV/MM

75. Apply the 5V step input to the MG TDA test input by removing the jumper of step 67 and connecting it between TB5-18 of TPA #2 and TB2-10 of TPA #2.

76. Perform the following DSKY operations:

a. VERB 41

NOUN 20

ENTR

b. Observe

NOUN 22

Flashing

c. +00000

ENTR

d. Observe

NOUN 22

Flashing

e. +00000

ENTR

f. Observe

NOUN 22

Flashing

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SUBSYSTEM	LEM G & N SYSTEM	ASSY
31. Set the sensitivities on the Oscillograph Amplifier as follows:		37. Remove the jumper from J2-B of the Auxiliary Input panel and place it on J2-A to monitor IG + Δθ short signal on the oscilloscope.
a. CHANNEL 1 to 5 MV/MM		
b. CHANNEL 4 to 0.2 V/CM		
c. CHANNEL 5 to 50 MV/MM		
32. Press CHART SPEEDS 1 pushbutton on the Oscillograph Control panel and set CHART DRIVE switch to MM/SEC.		38. Set the sensitivities on the Oscillograph Amplifier as follows:
33. Perform the following DSKY operations:		a. CHANNEL 1 to 5 MV/MM
VERB 42 ENTR		b. CHANNEL 4 to 0.2 V/CM
VERB 33 ENTR		c. CHANNEL 5 to 50 MV/MM.
34. Measure and record the oscilloscope indications of A through E as represented on figure 3.		39. Press CHART SPEEDS 1 pushbutton on the Oscillograph Control panel and set CHART DRIVE switch to MM/SEC.
35. When the Inner Gimbal Indicator on the Gimbal Position Control panel appears to stop, stop the Oscillograph. Set all sensitivities on the Oscillograph to OFF.		40. Perform the following DSKY operations:
+MG FRICTION TEST		VERB 42 ENTR
36. Perform the following DSKY operations:		VERB 33 ENTR
a. VERB 41 NOUN 20 ENTR		41. Measure and record the oscilloscope indications of A through E as represented on figure 3.
b. VERB 21 NOUN 22 Flashing		
c. +00000 ENTR		42. When the Inner Gimbal Indicator on the Gimbal Position Control panel appears to stop, stop the Oscillograph and record the maximum amplitude (neglect spikes) of CHANNELS 1 and 5. Using the equation given in Figure 1, calculate the maximum amplitude of CHANNEL 4. Record on data sheet. Set all sensitivities on the Oscillograph amplifiers to OFF.
d. VERB 22 NOUN 22 Flashing		
e. +00000 ENTR		-MG FRICTION TEST
f. VERB 23 NOUN 22 Flashing		43. Perform the following DSKY operations:
g. +00000 ENTR		a. VERB 41 NOUN 20 ENTR
h. VERB 41 NOUN 22 Displayed		b. VERB 21 NOUN 22 Flashing
i. VERB 24 NOUN 01 ENTR		c. +00000 ENTR
j. 00405 ENTR		d. VERB 22 NOUN 22 Flashing
k. VERB 21 NOUN 01 Flashing		e. +00000 ENTR
l. 40000 ENTR		
m. VERB 22 NOUN 01 Flashing		
n. 40077 ENTR		

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f. VERB 23 NOUN 22 Flashing		51. Perform the following DSKY operations:
g. +06750 ENTR		VERB 42 ENTR
h. VERB 41 NOUN 22 Displayed		VERB 33 ENTR
i. VERB 24 NOUN 01 ENTR		
j. 00407 ENTR		NOTE: Perform step 52 as quickly as possible as measurement time is limited to approximately 4 minutes. If measurement cannot be completed before pulse torquing ends turn the oscillograph off and repeat steps 43 and 51 and complete measurements not taken.
k. VERB 21 NOUN 01 Flashing		52. Measure and record the oscilloscope indication of A through E as represented on figure 3.
l. 14000 ENTR		53. When the Middle Gimbal Indicator on the Gimbal Position Control panel appears to stop, stop the Oscillograph. Set all sensitivities on the Oscillograph to OFF.
m. VERB 22 NOUN 01 Flashing		
n. 00000 ENTR		+MG FRICTION TEST
44. Remove the jumper from J2-A of the Auxiliary Input panel and place it on J2-D to monitor MG -Δθ abort signal on the oscilloscope.		54. Perform the following DSKY operations:
45. Remove the jumper from TB 2-31 and place it on TB 2-32 of TPA #2.		a. VERB 41 NOUN 20 ENTR
46. Remove the jumper from TB 2-47 and place it on TB 2-41 of TPA #2.		b. VERB 21 NOUN 22 Flashing
47. Set CHANNEL 2 on the Oscillograph Signal Selector panel to 5 and CHANNEL 4 and 5 to AUX and monitor the following signals:		c. +00000 ENTR
a. MG CDU Fine Error on CHANNEL 2		d. VERB 22 NOUN 22 Flashing
b. MG TM Current on CHANNEL 4		e. +00000 ENTR
c. MG CDU Coarse Error on CHANNEL 5.		f. VERB 23 NOUN 22 Flashing
48. Insure that CHADC and CHSAC pushbuttons on the Oscillograph Signal Selector panel are lighted.		g. -06750 ENTR
49. Set the sensitivities on the Oscillograph Amplifiers as follows:		h. VERB 41 NOUN 22 Displayed
a. CHANNEL 2 to 5 MV/MM		i. VERB 24 NOUN 01 ENTR
b. CHANNEL 4 to 0.2 V/CM		j. 00407 ENTR
c. CHANNEL 5 to 50 MV/MM		k. VERB 21 NOUN 01 Flashing
50. Press CHART SPEEDS 1 pushbutton on the Oscillograph Control panel and set CHART SPEED switch to MM/SEC.		l. 63777 ENTR

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SUBSYSTEM	LEM G & N SYSTEM	ASSY
m. VERB 22 NOUN 01 Flashing		55. Remove the jumper from J2-D of the Auxiliary Input panel and place it on J2-C to monitor MG + Δθ abort signal on the Oscilloscope.
n. 40000 ENTR		56. Set the sensitivities on the Oscillograph Amplifier as follows:
55. Remove the jumper from J2-D of the Auxiliary Input panel and place it on J2-C to monitor MG + Δθ abort signal on the Oscilloscope.		a. CHANNEL 2 to 5 MV/MM
56. Set the sensitivities on the Oscillograph Amplifier as follows:		b. CHANNEL 4 to 0.2 V/CM
a. CHANNEL 2 to 5 MV/MM		c. CHANNEL 5 to 50 MV/MM.
b. CHANNEL 4 to 0.2 V/CM		57. Press CHART SPEEDS 1 pushbutton on the Oscillograph Control panel and set CHART SPEED switch to MM/SEC.
c. CHANNEL 5 to 50 MV/MM.		58. Perform the following DSKY operations:
57. Press CHART SPEEDS 1 pushbutton on the Oscillograph Control panel and set CHART SPEED switch to MM/SEC.		VERB 42 ENTR
58. Perform the following DSKY operations:		VERB 33 ENTR
VERB 42 ENTR		
VERB 33 ENTR		
NOTE: Perform step 59 as quickly as possible as measurement time is limited to approximately 2 minutes. If measurement cannot be completed before pulse torquing ends turn the oscillograph off and repeat steps 54 and 58 and complete measurements not taken.		
59. Measure and record the oscilloscope indications of A through E as represented in figure 3.		
60. When the Middle Gimbal Indicator on the Gimbal Position Control panel appears to stop, stop the Oscillograph and record the maximum amplitude (neglect spikes) of CHANNELS 2 and 5 on the data sheets. Using		

SUBSYSTEM	LEM G & N SYSTEM	ASSY
c. 3 10 MV/MM		73. Determine and record the number of error signal oscillation peaks outside ±1 mm of the final value. (See Figure 2.) Record magnitude A. Record the time t for the error signal to reach and stay within 1 mm of its final value.
66. Set the PHASE SHIFT SELECTOR on the Phase Sensitive Demodulators of CHANNELS 1, 2 and 3 to 300 ~ 0 deg. Set FILTER switches to HI.		
IG STEP RESPONSE		
67. Apply the 10V step input to the IG TDA test input by connecting a jumper between TB5-27 of TPA #2 and TB2-11 of TPA #2.		
68. Perform the following DSKY operations:		
a. VERB 41 NOUN 20 ENTR		
b. Observe VERB 21 NOUN 22 Flashing		
c. +00000 ENTR		
d. Observe VERB 22 NOUN 22 Flashing		
e. +00000 ENTR		
f. Observe VERB 23 NOUN 22 Flashing		
g. +00000 ENTR		
h. Observe VERB 41 NOUN 22 Displayed		
i. VERB 36 ENTR		
69. Start the Oscillograph by setting the CHART DRIVE switch to MM/SEC.		
70. Set and hold the SERVO TEST switch on the TPA #2 in the up position.		
71. After a constant servo error is observed on CHANNEL 1 of the Oscillograph, release the SERVO TEST switch on TPA #2.		
72. After a constant servo error is observed on CHANNEL 1 of the Oscillograph, stop the Oscillograph.		

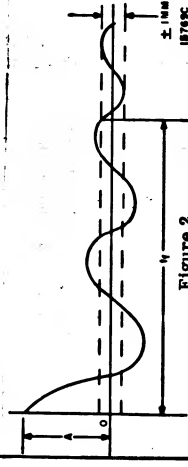


Figure 2

MG STEP RESPONSE

74. Set the following Channel sensitivities on the Oscillograph Amplifier panel:

Channel	Sensitivity
a. 1	10 MV/MM
b. 2	20 MV/MM
c. 3	10 MV/MM

75. Apply the 5V step input to the MG TDA test input by removing the jumper of step 67 and connecting it between TB5-18 of TPA #2 and TB2-10 of TPA #2.

76. Perform the following DSKY operations:

a. VERB 41 NOUN 20 ENTR	
b. Observe VERB 21 NOUN 22 Flashing	
c. +00000 ENTR	
d. Observe VERB 22 NOUN 22 Flashing	
e. +00000 ENTR	
f. Observe VERB 23 NOUN 22 Flashing	

DATE 15 MAR 66

SUBSYSTEM LEM G &amp; N SYSTEM

ASSY

g. +00000 ENTR

h. Observe

i. VERB 41 NOUN 22 Displayed

j. VERB 36 ENTR

77. Start the Oscillograph by setting the

CHART DRIVE switch to MM/SEC. Set and

hold the SERVO TEST switch on the TPA #2

in the up position.

78. After a constant servo error is ob-

served on CHANNEL 2 of the Oscillograph,

release the SERVO TEST switch on the

TPA #2.

79. After a constant servo error is ob-

served on CHANNEL 2 of the Oscillograph,

stop the Oscillograph.

80. Determine and record the number of

error signal oscillation peaks outside  $\pm 1$  mm

of the final value. (See Figure 2.) Record

magnitude A. Record the time  $t_f$  for the

error signal to reach and stay within 1 mm of

its final value.

OG STEP RESPONSE

81. Set the following channel Sensi-

tivities on the Oscillograph Amplifier panel:

Channel Sensitivity

a. 1 10 MV/MM

b. 2 10 MV/MM

c. 3 20 MV/MM

82. Apply the 5V step input to the OG TDA

test input by removing the jumper of step 75

and connecting it between TB5-18 of TPA #2

and TB2-4 of TPA #2.

83. Perform the following DSKY operations:

a. VERB 41 NOUN 20 ENTR

b. Observe

VERB 21

NOUN 22 Flashing

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## APOLLO 68N

## EQUIPMENT TEST

## DATA SHEET 1 OF 4

## JOB GIMBAL RESPONSE TEST

JDC

NO. 12619

REV. H

INITIAL TORR

ASSEMBLY UNDER TEST		TEST HISTORY	
SER. NO.	DWG	DATE	TIME
		START	END
		START	TOTAL ELAPSED
MAJOR GROUND SUPPORT EQUIPMENT			
NAME		SER. NO.	CAL DATE
NAME		SER. NO.	CAL DATE
CONDUCTED BY		APPROVED BY	
NAME/AFFILIATION		NAME/AFFILIATION	

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ ACC
5	28 VDC Bus voltage	vdc	27.75		28.25	
6.a	OG Error signal	mv			60	
6.b	MG Error signal	mv			60	
6.c	IG Error signal	mv			60	
6.d	X Gyro Error signal	mv			60	
6.e	Z Gyro Error signal	mv			60	
7.a	Total OG TDA	volts			10	
7.b	Total MG TDA	volts			10	
7.c	Total IG TDA	volts			10	
16	OG - $\Delta$ abort	Refer to fig 1				
16.a.A	Amplitude	peak volts	4		10	
16.a.B	Pulse width	$\mu$ sec	2		4	
16.a.C	Droop	volts			$\frac{A}{5}$	
16.a.D	Rise Time	$\mu$ sec			0.5	

DATE 15 MAR 66

FORM 0046  
Ch. 7-3-65

SUBSYSTEM LEM G &amp; N SYSTEM

ASSY

c. +00000

d. Observe

e. VERB 22 NOUN 22 Flashing

f. +00000 ENTR

f. Observe

VERB 23

NOUN 22 Flashing

ENTR

ENTR

ENTR

ENTR

ENTR

ENTR

ENTR

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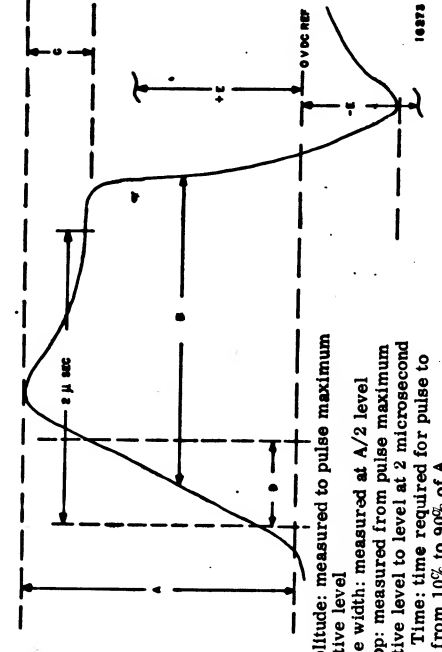


Figure 3. Waveform Description

A - Amplitude: measured to pulse maximum positive level

B - Pulse width: measured at A/2 level

C - Droop: measured from pulse maximum positive level to level at 2 microsecond

D - Rise Time: time required for pulse to rise from 10% to 90% of A.

E - Noise: (No pulse)

DATE 15 MAR 66

## APOLLO 68N

## EQUIPMENT TEST

## DATA SHEET 2 OF 4

## JOB GIMBAL RESPONSE TEST

JDC

NO. 12619

REV. H

REV. H

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ ACC
16.a.E	Noise with respect to 0 vdc reference	volts	-4.0		+4.0	
16.b	IRIG PVR	vdc	5.94		6.06	
16.c	IRIG Torque Current Monitor	vdc	1.000		1.12	
16.d	IRIG SF voltage	vdc	5.94		6.06	
23	OG - $\Delta$ abort	Refer to fig 1				
23.A	Amplitude	peak volts	4		10	
23.B	Pulse width	$\mu$ sec	2		4	
23.C	Droop	volts			$\frac{A}{5}$	
23.D	Rise Time	$\mu$ sec			0.5	
23.E	Noise with respect to 0 vdc reference	volts	-4.0		+4.0	
24	OG CDU Fine Error on CH3	volt rms	-0.070		+0.070	
24	OG TM Current on CH4	vdc	-0.125		+0.125	
24	OG CDU Coarse Error on CH5	volt rms	-0.680		+0.680	
34	IG - $\Delta$ abort	Refer to fig 1				
34.A	Amplitude	peak volts	4		10	
34.B	Pulse width	$\mu$ sec	2		4	
34.C	Droop	volts			$\frac{A}{5}$	
34.D	Rise Time	$\mu$ sec			0.5	

DATE 15 MAR 66

FORM 0046  
Ch. 7-3-65

## SUBSYSTEM LEM G &amp; N SYSTEM

ASSY

g. +00000 ENTR

h. Observe

VERB 41 NOUN 22 Displayed

ENTR

1. VERB 36

ENTR

77. Start the Oscillograph by setting the

CHART DRIVE switch to MM/SEC. Set and

hold the SERVO TEST switch on the TPA #2

in the up position.

78. After a constant servo error is ob-

served on CHANNEL 2 of the Oscillograph,

release the SERVO TEST switch on the

TPA #2.

79. After a constant servo error is ob-

served on CHANNEL 2 of the Oscillograph,

stop the Oscillograph.

80. Determine and record the number of

error signal oscillation peaks outside  $\pm 1$  mm

of the final value. (See Figure 2.) Record

the magnitude A. Record the time  $t_r$  for the

error signal to reach and stay within 1 mm of

its final value.

OG STEP RESPONSE

81. Set the following channel Sensi-

tivities on the Oscillograph Amplifier panel:

Channel Sensitivity

a. 1 10 MV/MM

b. 2 10 MV/MM

c. 3 20 MV/MM

82. Apply the 5V step input to the OG TDA

test input by removing the jumper of step 76

and connecting it between TB5-18 of TPA #2

and TB2-4 of TPA #2.

83. Perform the following DSKY operations:

a. VERB 41 NOUN 20 ENTR

b. Observe

VERB 21 NOUN 22 Flashing

DATE 15 MAR 66

## APOLLO 68N

## EQUIPMENT TEST

DATA SHEET 1 OF 4

## JOB GIMBAL RESPONSE TEST

JDC

NO. 12619

REV. H

INITIAL TDOR

## ASSEMBLY UNDER TEST

DATE

TIME

END

SITE / LOCATION

TOTAL ELAPSED

## MAJOR GROUND SUPPORT EQUIPMENT

NAME

SER. NO.

CAL DATE

NAME

SER. NO.

CAL DATE

CONDUCTED BY

NAME/AFFILIATION

APPROVED BY

NAME/AFFILIATION

JDC

ITEM

NO.

PARAMETER

UNITS

MIN

VALUE

RECORDED VALUE

MAX

VALUE

REJ

ACC

3

28 VDC Bus voltage

vdc

27.75

28.25

6.a

OG Error signal

mv

60

6.b

MG Error signal

mv

60

6.c

IG Error signal

mv

60

6.d

X Gyro Error

signal

60

6.e

Z Gyro Error

signal

60

7.a

Total OG TDA

volts

10

7.b

Total MG TDA

volts

10

7.c

Total IG TDA

volts

10

16

OG -  $\Delta \theta$  abort

Refer to

fig 1

16.a.A

Amplitude

peak

volts

4

16.a.B

Pulse width

 $\mu$ sec

2

16.a.C

Droop

volts

A

5

16.a.D

Rise Time

 $\mu$ sec

0.5

## SUBSYSTEM LEM G &amp; N SYSTEM

ASSY

c. +00000

ENTR

f. Observe

VERB 23 NOUN 22 Flashing

ENTR

d. Observe

VERB 22 NOUN 22 Flashing

ENTR

e. +00000

ENTR

g. +00000

ENTR

h. Observe

VERB 23 NOUN 22 Flashing

ENTR

i. Observe

VERB 22 NOUN 22 Flashing

ENTR

j. Observe

VERB 23 NOUN 22 Flashing

ENTR

k. Observe

VERB 22 NOUN 22 Flashing

ENTR

l. Observe

VERB 23 NOUN 22 Flashing

ENTR

m. Observe

VERB 22 NOUN 22 Flashing

ENTR

n. Observe

VERB 23 NOUN 22 Flashing

ENTR

o. Observe

VERB 22 NOUN 22 Flashing

ENTR

p. Observe

VERB 23 NOUN 22 Flashing

ENTR

q. Observe

VERB 22 NOUN 22 Flashing

ENTR

r. Observe

VERB 23 NOUN 22 Flashing

ENTR

s. Observe

VERB 22 NOUN 22 Flashing

ENTR

t. Observe

VERB 23 NOUN 22 Flashing

ENTR

u. Observe

VERB 22 NOUN 22 Flashing

ENTR

v. Observe

VERB 23 NOUN 22 Flashing

ENTR

w. Observe

VERB 22 NOUN 22 Flashing

ENTR

x. Observe

VERB 23 NOUN 22 Flashing

ENTR

y. Observe

VERB 22 NOUN 22 Flashing

ENTR

z. Observe

VERB 23 NOUN 22 Flashing

ENTR

aa. Observe

VERB 22 NOUN 22 Flashing

ENTR

ab. Observe

VERB 23 NOUN 22 Flashing

ENTR

ac. Observe

VERB 22 NOUN 22 Flashing

ENTR

ad. Observe

VERB 23 NOUN 22 Flashing

ENTR

ae. Observe

VERB 22 NOUN 22 Flashing

ENTR

af. Observe

VERB 23 NOUN 22 Flashing

ENTR

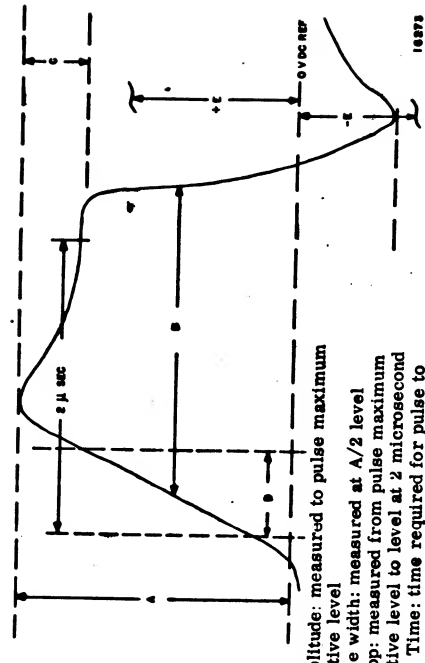


Figure 3. Waveform Description

DATE 15 MAR 66

## APOLLO 68N

## EQUIPMENT TEST

DATA SHEET 2 OF 4

## JOB GIMBAL RESPONSE TEST

JDC

NO. 12619

REV. H

INITIAL TDOR

## ASSEMBLY UNDER TEST

DATE

TIME

END

SITE / LOCATION

TOTAL ELAPSED

## MAJOR GROUND SUPPORT EQUIPMENT

NAME

SER. NO.

CAL DATE

NAME

SER. NO.

CAL DATE

CONDUCTED BY

NAME/AFFILIATION

APPROVED BY

NAME/AFFILIATION

JDC

ITEM

NO.

PARAMETER

UNITS

MIN

VALUE

RECORDED VALUE

MAX

VALUE

REJ

ACC

16.a.E

Noise with respect

to 0 vdc reference

volts

-4.0

-4.0

16.b

IRIG PVR

vdc

5.94

6.06

16.c

IRIG Torque

vdc

1.000

1.12

16.d

IRIG SF voltage

vdc

5.94

6.06

23

OG +  $\Delta \theta$  abort

Refer to fig 1

23.A

Amplitude

peak

volts

4

23.B

Pulse width

 $\mu$ sec

2

23.C

Droop

volts

A

5

23.D

Rise Time

 $\mu$ sec

0.5

23.E

Noise with respect

to 0 vdc reference

volts

-4.0

-4.0

24

OG CDU Fine

vdc

-0.070

+0.070

24

OG TM Current on

CH4

rms

-0.125

+0.125

24

OG CDU Coarse

Error on CH5

rms

-0.680

+0.680

34

IG -  $\Delta \theta$  abort

Refer to fig 1

34.A

Amplitude

peak

volts

4

34.B

Pulse width

 $\mu$ sec

2

34.C

Droop

volts

A

5

34.D

Rise Time

 $\mu$ sec

0.5

DATE 15 MAR 66

FORM 00146

CIR 7-23-65

APOLLO G&N  
EQUIPMENT TEST  
DATA SHEET 3 OF 4

JDC  
NO. 12819  
REV. H

JOB GIMBAL RESPONSE TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ ACC
34.E	Noise with respect to 0 vdc reference	volts	-4.0		+4.0	
41	IG + $\Delta\theta$ abort	Refer to fig 1				
41.A	Amplitude	peak volts	4		10	
41.B	Pulse width	$\mu$ sec	2		4	
41.C	Droop	volts			$\frac{A}{5}$	
41.D	Rise Time	$\mu$ sec			0.5	
41.E	Noise with respect to 0 vdc reference	volts	-4.0		+4.0	
42	IG CDU Fine Error on CH1	volt rms	-0.070		+0.070	
42	IG TM Current on CH4	vdc	-0.125		+0.125	
42	IG CDU Coarse Error on CH5	volt rms	-0.680		+0.680	
52	MG - $\Delta\theta$ abort	Refer to fig 1				
52.A	Amplitude	peak volts	4		10	
52.B	Pulse width	$\mu$ sec	2		4	
52.C	Droop	volts			$\frac{A}{5}$	
52.D	Rise Time	$\mu$ sec			0.5	
52.E	Noise with respect to 0 vdc reference	volts	-4.0		+4.0	
59	MG + $\Delta\theta$ abort	Refer to fig 1				

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JDC NO. 12819  
REV. H

APOLLO G&N  
EQUIPMENT TEST  
DATA SHEET 4 OF 4

JDC  
NO. 12819  
REV. H

JOB GIMBAL RESPONSE TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ ACC
59.A	Amplitude	peak volts	4		10	
59.B	Pulse width	$\mu$ sec	2		4	
59.C	Droop	volts			$\frac{A}{5}$	
59.D	Rise Time	$\mu$ sec			0.5	
59.E	Noise with respect to 0 vdc reference	volts	-4.0		+4.0	
60	MG CDU Fine Error on CH2	volt rms	-0.070		+0.070	
60	MG TM Current on CH4	vdc	-0.125		+0.125	
60	MG CDU Coarse Error on CH5	volt rms	-0.680		+0.680	
73	Oscillation peaks				3	
	Magnitude A	mm				
	$t_f$	ms			100	
80	Oscillation peaks				3	
	Magnitude A	mm				
	$t_f$	ms			100	
87	Oscillation peaks				3	
	Magnitude A	mm				
	$t_f$	ms			100	
	AGC Displays	All DSKY displays and indications reacted as specified				

DATE 15 MAR 66

JDC NO. 12819  
REV. H



APOLLO G&N  
EQUIPMENT TEST  
DATA SHEET 3 OF 4

JDC  
NO. 12619  
REV. H

JOB GIMBAL RESPONSE TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ ACC
34.E	Noise with respect to 0 vdc reference	volts	-4.0		+4.0	
41	IG + Δθ abort	Refer to fig 1				
41.A	Amplitude	peak volts	4		10	
41.B	Pulse width	μsec			4	
41.C	Droop	volts	2		$\frac{A}{5}$	
41.D	Rise Time	μsec			0.5	
41.E	Noise with respect to 0 vdc reference	volts	-4.0		+4.0	
42	IG CDU Fine Error on CH1	volt rms	-0.070		+0.070	
42	IG TM Current on CH4	vdc	-0.125		+0.125	
42	IG CDU Coarse Error on CH5	volt rms	-0.680		+0.680	
52	MG - Δθ abort	Refer to fig 1				
52.A	Amplitude	peak volts	4		10	
52.B	Pulse width	μsec	2		4	
52.C	Droop	volts			$\frac{A}{5}$	
52.D	Rise Time	μsec			0.5	
52.E	Noise with respect to 0 vdc reference	volts	-4.0		+4.0	
59	MG + Δθ abort	Refer to fig 1				

DATE 15 MAR 66

PAR 10-117  
CH 5, 7-10-65

APOLLO G&N  
EQUIPMENT TEST  
DATA SHEET 4 OF 4

JDC  
NO. 12619  
REV. H

JOB GIMBAL RESPONSE TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ ACC
59.A	Amplitude	peak volts	4		10	
59.B	Pulse width	μsec	2		4	
59.C	Droop	volts			$\frac{A}{5}$	
59.D	Rise Time	μsec			0.5	
59.E	Noise with respect to 0 vdc reference	volts	-4.0		+4.0	
60	MG CDU Fine Error on CH2	volt rms	-0.070		+0.070	
60	MG TM Current on CH4	vdc	-0.125		+0.125	
60	MG CDU Coarse Error on CH5	volt rms	-0.680		+0.680	
73	Oscillation peaks				3	
	Magnitude A	mm				
	t <sub>r</sub>	ms			100	
80	Oscillation peaks				3	
	Magnitude A	mm				
	t <sub>r</sub>	ms			100	
87	Oscillation peaks				3	
	Magnitude A	mm				
	t <sub>r</sub>	ms			100	
	AGC Displays	All DSKY displays and indications reacted as specified				

DATE 15 MAR 66

SUBSYSTEM LEM G & N SYSTEM

DESCRIPTION A gimbal friction test is performed by driving the Outer and Inner gimbals through plus and minus 360°, one at a time, and the Middle gimbal through 135°. During the slow periods the Fine and Coarse CDU errors and gimbal torque motor current are monitored on the Oscillograph. In addition the plus and minus Δθ abort signal characteristics are checked during each gimbal slew. After the gimbal friction test the OG, MG and IG stab loop responses are tested by providing a step input to each DC Stab Amp.

Rev.	Date	TORR	PAGES REVISED	APPROVAL	REFERENCES
1	7-5-66	30046	1-7	MM	PS 6015000
2	7-21-66	30273	2	MM	ACMA
3	8-5-66	30322	2, 4, 6-9	EA	MBV
4	8-18-66	30702	2, 3	EA	MBV
5	11-10-66	31903	2, 3	EA	MBV
6	1-12-67	32605	2	EA	MBV
7	1-18-67	32668	2	EA	MBV
8	2-2-67	32889	All	EA	MBV
9	11-30-67	35183	1-4, 6-9	All	EA

INITIALIZATION

1. Perform JDC 12613 to establish a Master Initialization condition.
2. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 173.
3. Measure the 28 VDC Bus voltage indicated on the DVM. Record the indication.
4. Insure that the Inner, Middle and Outer gimbals are set to approximately 0.0° as

Indicated on the Gimbal Position Control panel. If not, perform the following DSKY operations:

- a. VERB 41 NOUN 20 ENTR
- b. Observe VERB 21 N 22 Flashing ENTR
- c. +00000
- d. Observe VERB 22 NOUN 22 Flashing ENTR
- e. +00000

VERIFICATION WITH SIDL REQUIRED BEFORE USE

DATE 15 MAR 66

SUBSYSTEM LEM G & N SYSTEM

ASSY	ASSY
f. Observe VERB 23 NOUN 22 Flashing ENTR	f. VERB 23 NOUN 22 Flashing ENTR
g. +00000	g. +00000
h. Observe VERB 41 NOUN 22 Displayed ENTR	h. VERB 41 NOUN 22 Displayed ENTR
i. VERB 24 NOUN 01 ENTR	i. VERB 24 NOUN 01 ENTR
j. 00403	j. 00403
k. VERB 21 NOUN 01 Flashing ENTR	k. VERB 21 NOUN 01 Flashing ENTR
l. 37777	l. 37777
m. VERB 23 NOUN 01 Flashing ENTR	m. VERB 23 NOUN 01 Flashing ENTR
n. 37743	n. 37743
9. Place jumpers between the following points:	
OG Error Signal 133	From To
MG Error Signal 134	DIRECT PROBES CHADC
IG Error Signal 135	OUTPUT
X Gyro Error Signal 233	OUTPUT
Z Gyro Error Signal 234	OUTPUT
7. Set the Primary Signal Selector panel to monitor the following signals on the PAYM. Record the total value of each:	
OG Error Signal 133	J2F (OG-Δθ Abort) J1-A (Scope)
MG Error Signal 134	B CH1 Input
IG Error Signal 135	SCOPE A
X Gyro Error Signal 233	SCOPE A
Z Gyro Error Signal 234	TRIGGER IN, (In AIP)
TPA #2 DIRECT PROBE TBI-45	TBI-45
TPA #2 BUFFERED PROBE TBI-35	TBI-35
TPA #2 PULSE PROBE TBI-18 (Io)	(Io) 18 (Io)
TBI-6 (Biu)	TBI-6 (Biu)
TBI-9 (Bik)	TBI-9 (Bik)
10. Deleted.	
11. Set CHANNEL 3 on Oscillograph Signal Selector panel to 5 and CHANNEL 4 and 5 to 15 and monitor the following signals:	
a. OG CDU Fine Error on CHANNEL 3	
b. OG TM current on CHANNEL 4	
c. OG CDU Coarse Error on CHANNEL 5.	

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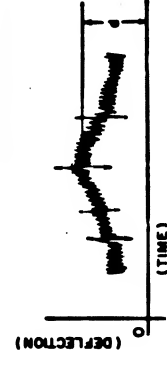
SUBSYSTEM LEM G & N SYSTEM

ASSY	ASSY
12. Insure that CH3AC, CH4DC and CH5AC pushbuttons on the Oscillograph Signal Selector panel are lighted. Insure that the PHASE SHIFT SELECTOR switches on the Oscillograph Phase Sensitive Demodulators for CHANNELS 1, 2, 3, and 5 are set to the 800 ~ 0 DEG position and the FILTER switches are set to LO.	b. IRIG PVR (PIPA & IRIG 8F MONITOR Selector switch on TPA #1 to position 10) on the Current Source Monitor per JDC 18016
13. Set the sensitivities on the Oscillograph Amplifier as follows:	c. IRIG Torque Current Monitor (PIPA & IRIG 8F MONITOR Selector switch on TPA #1 to position 11) on the Current Source Monitor per JDC 18016
a. CHANNEL 3 to 5 MV/MM	d. IRIG Scale Factor (PIPA & IRIG 8F MONITOR Selector switch on TPA #1 to position 12) on the Current Source Monitor per JDC 18016
b. CHANNEL 4 to 0.2 V/CM	
c. CHANNEL 5 to 50 MV/MM.	
14. Press CHART SPEEDS 1 pushbutton on the Oscillograph Control panel and set CHART DRIVE switch to MM/SEC.	17. When the Outer Gimbal Indicator on the Gimbal Position Control panel appears to stop, stop the Oscillograph. Set all sensitivities on the Oscillograph to OFF.
15. Perform the following DSKY operations:	-OG FRICTION TEST
VERB 42 ENTR	18. Perform the following DSKY operations:
VERB 33 ENTR	NOTE: If the measurements in step 16 cannot be completed before pulse torquing ends, turn the Oscillograph off and repeat steps 8 and 15 and complete measurements not taken.
NOTE: If the measurements in step 16 cannot be completed before pulse torquing ends, turn the Oscillograph off and repeat steps 8 and 15 and complete measurements not taken.	a. VERB 41 NOUN 20 ENTR
16. Measure and record the following signals:	b. VERB 21 NOUN 22 Flashing ENTR
a. Scope Indications A through E (figure 3)	c. +00000
NOTE: Insure that cable W65 plug P1 is connected to jack J4 on Current Source Monitor panel and that cable W65 plug P2 is connected to jack J15 on TPA #1.	d. VERB 22 NOUN 22 Flashing ENTR
	e. +00000
	f. VERB 23 NOUN 22 Flashing ENTR
	g. +00000
	h. VERB 41 NOUN 22 Displayed ENTR
	i. VERB 24 NOUN 01 ENTR
	j. 00403
	k. VERB 21 NOUN 01 Flashing ENTR
	l. 40000
	m. VERB 22 NOUN 01 Flashing ENTR
	n. 40077

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SUBSYSTEM LEM G & N SYSTEM

ASSY	ASSY
19. Remove jumper from J3-F of the Auxiliary Input panel and place it on J3-E to monitor OG-Δθ abort signal on the oscilloscope.	
20. Set the sensitivities on the Oscillograph Amplifier as follows:	
a. CHANNEL 3 to 5 MV/MM	
b. CHANNEL 4 to 0.2 V/CM	
c. CHANNEL 5 to 50 MV/MM.	
21. Press CHART SPEEDS 1 pushbutton on the Oscillograph Control panel and set CHART DRIVE switch to MM/SEC.	
22. Perform the following DSKY operations:	
VERB 43 ENTR	
VERB 33 ENTR	
23. Measure and record the oscilloscope indication of A through E as represented on figure 3.	
24. When the Outer Gimbal Indicator on the Gimbal Position control panel appears to stop, stop the Oscillograph and record the maximum amplitude (neglect spikes) of CHANNELS 3 and 5. Using the equation given in Figure 1, calculate from the Oscillograph chart the maximum amplitude of CHANNEL 4. Record on data sheet. Set all sensitivities on the Oscillograph Amplifiers to OFF.	
	a. VERB 41 NOUN 20 ENTR
	b. VERB 21 NOUN 22 Flashing ENTR
	c. +00000
	d. VERB 22 NOUN 22 Flashing ENTR
	e. +00000
	f. VERB 23 NOUN 22 Flashing ENTR
	g. +00000
	h. VERB 41 NOUN 22 Displayed ENTR
	i. VERB 24 NOUN 01 ENTR
	j. 00405
	k. VERB 21 NOUN 01 Flashing ENTR
	l. 37777
	m. VERB 22 NOUN 01 Flashing ENTR
	n. 37743



Where 0.2 is the Oscillograph sensitivity in volts per centimeter, and d is the deflection in centimeters measured from zero reference to the midpoint of trace. Ignore any noise spikes.

-IG FRICTION TEST

25. Perform the following DSKY operations:

- a. VERB 41 NOUN 20 ENTR
- b. VERB 21 NOUN 22 Flashing ENTR
- c. +00000
- d. VERB 22 NOUN 22 Flashing ENTR
- e. +00000
- f. VERB 23 NOUN 22 Flashing ENTR
- g. +00000
- h. VERB 41 NOUN 22 Displayed ENTR
- i. VERB 24 NOUN 01 ENTR
- j. 00405
- k. VERB 21 NOUN 01 Flashing ENTR
- l. 37777
- m. VERB 22 NOUN 01 Flashing ENTR
- n. 37743

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SUBSYSTEM	LEM G & N SYSTEM	ASSY
26. Remove the jumper from J2-E of Auxiliary Input panel and place it on J2-B to monitor IG -Δθ abort signal on the scope.		to stop, stop the Oscilloscope. Set all sensitivities on the Oscilloscope to OFF.
27. Remove the jumper from TB1 45 of TPA #2 and place it on TB 2-31 of TPA #2.		<b>+IG FRICTION TEST</b>
28. Remove the jumper TB 2-35 and place it on TB 2-47 of TPA #2.		36. Perform the following DSKY operations:
29. Set CHANNEL 1 on the Oscilloscope Signal Selector panel to 5 and CHANNEL 4 and 5 to 15 and monitor the following signals:		a. VERB 41 NOUN 20 ENTR
a. IG CDU Fine Error on CHANNEL 1		b. VERB 21 NOUN 22 Flashing
b. IG TM Current on CHANNEL 4		c. +00000 ENTR
c. IG CDU Coarse Error on CHANNEL 5.		d. VERB 22 NOUN 22 Flashing
30. Insure that CHADC and CHSAC pushbuttons on the Oscilloscope Signal Selector panel are lighted.		e. +00000 ENTR
31. Set the sensitivities on the Oscilloscope Amplifier as follows:		f. VERB 23 NOUN 22 Flashing
a. CHANNEL 1 to 5 MV/MM		g. +00000 ENTR
b. CHANNEL 4 to 0.2 V/CM		h. VERB 41 NOUN 22 Displayed
c. CHANNEL 5 to 50 MV/MM		i. VERB 24 NOUN 01 ENTR
32. Press CHART SPEEDS 1 pushbutton on the Oscilloscope Control panel and set CHART DRIVE switch to MM/SEC.		j. 00405 ENTR
33. Perform the following DSKY operations:		k. VERB 21 NOUN 01 Flashing
VERB 42 ENTR		l. 40000 ENTR
VERB 33 ENTR		m. VERB 22 NOUN 01 Flashing
34. Measure and record the oscilloscope indications of A through E as represented on figure 3.		n. 40077 ENTR
35. When the Inner Gimbal Indicator on the Gimbal Position Control panel appears		37. Remove the jumper from J2-B of the Auxiliary Input panel and place it on J2-A to monitor IG + Δθ abort signal on the oscilloscope.
		38. Set the sensitivities on the Oscilloscope Amplifier as follows:
		a. CHANNEL 1 to 5 MV/MM
		b. CHANNEL 4 to 0.2 V/CM
		c. CHANNEL 5 to 50 MV/MM.
		39. Press CHART SPEEDS 1 pushbutton on the Oscilloscope Control panel and set CHART DRIVE switch to MM/SEC.
		40. Perform the following DSKY operations:
		VERB 42 ENTR
		VERB 33 ENTR

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SUBSYSTEM	LEM G & N SYSTEM	ASSY
41. Measure and record the oscilloscope indications of A through E as represented on figure 3.		46. Remove the jumper from TB 2-47 and place it on TB 2-41 of TPA #2.
42. When the Inner Gimbal Indicator on the Gimbal Position Control panel appears to stop, stop the Oscilloscope and record the maximum amplitude (neglect spikes) of CHANNELS 1 and 2 on the Oscilloscope and record the maximum amplitude of CHANNEL 4.		47. Set CHANNEL 3 on the Oscilloscope Signal Selector panel to 5 and CHANNEL 4 and 5 to 15 and monitor the following signals:
43. Using the equation given in Figure 1, calculate the maximum amplitude of CHANNEL 4. Record on data sheet. Set all sensitivities on the Oscilloscope amplifiers to OFF.		a. MG CDU Fine Error on CHANNEL 3
<b>-MG FRICTION TEST</b>		b. MG TM Current on CHANNEL 4
44. Perform the following DSKY operations:		c. MG CDU Coarse Error on CHANNEL 5.
a. VERB 41 NOUN 20 ENTR		48. Insure that CHADC and CHSAC pushbuttons on the Oscilloscope Signal Selector panel are lighted.
b. VERB 21 NOUN 22 Flashing		49. Set the sensitivities on the Oscilloscope Amplifiers as follows:
c. +00000 ENTR		a. CHANNEL 2 to 5 MV/MM
d. VERB 22 NOUN 22 Flashing		b. CHANNEL 4 to 0.2 V/CM
e. +00000 ENTR		c. CHANNEL 5 to 50 MV/MM
f. VERB 23 NOUN 22 Flashing		50. Press CHART SPEEDS 1 pushbutton on the Oscilloscope Control panel and set CHART SPEED switch to MM/SEC.
g. +00750 ENTR		51. Perform the following DSKY operations:
h. VERB 41 NOUN 22 Displayed		VERB 42 ENTR
i. VERB 24 NOUN 01 ENTR		VERB 33 ENTR
j. 00407 ENTR		NOTE: Perform step 53 as quickly as possible as measurement time is limited to approximately 4 minutes. If measurement cannot be completed before pulse torquing ends turn the oscilloscope off and repeat steps 43 and 51 and complete measurements not taken.
k. VERB 21 NOUN 01 Flashing		
l. 14000 ENTR		
m. VERB 22 NOUN 01 Flashing		
n. 00000 ENTR		
44. Remove the jumper from J2-A of the Auxiliary Input panel and place it on J2-D to monitor MG -Δθ abort signal on the oscilloscope.		
45. Remove the jumper from TB 2-31 and place it on TB 2-32 of TPA #2.		

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SUBSYSTEM	LEM G & N SYSTEM	ASSY
52. Measure and record the oscilloscope indication of A through E as represented on figure 3.		57. Press CHART SPEEDS 1 pushbutton on the Oscilloscope Control panel and set CHART DRIVE switch to MM/SEC.
53. When the Middle Gimbal Indicator on the Gimbal Position Control panel appears to stop, stop the Oscilloscope. Set all sensitivities on the Oscilloscope to OFF.		58. Perform the following DSKY operations:
<b>+MG FRICTION TEST</b>		VERB 42 ENTR
54. Perform the following DSKY operations:		VERB 33 ENTR
a. VERB 41 NOUN 20 ENTR		NOTE: Perform step 59 as quickly as possible as measurement time is limited to approximately 2 minutes. If measurement cannot be completed before pulse torquing ends turn the oscilloscope off and repeat steps 54 and 56 and complete measurements not taken.
b. VERB 21 NOUN 22 Flashing		59. Measure and record the oscilloscope indications of A through E as represented in figure 3.
c. +00000 ENTR		60. When the Middle Gimbal Indicator on the Gimbal Position Control panel appears to stop, stop the Oscilloscope and record the maximum amplitude (neglect spikes) of CHANNELS 2 and 5 on the data sheets. Using the equation given in Figure 1, calculate from the Oscilloscope chart the maximum amplitude of CHANNEL 4. Record on data sheet. Set all sensitivities on the Oscilloscope Amplifiers to OFF.
d. VERB 22 NOUN 22 Flashing		61. Remove all jumper cables placed during this procedure.
e. +00000 ENTR		
f. VERB 23 NOUN 22 Flashing		
g. +00750 ENTR		
h. VERB 41 NOUN 22 Displayed		
i. VERB 24 NOUN 01 ENTR		
j. 00407 ENTR		
k. VERB 21 NOUN 01 Flashing		
l. 63777 ENTR		
m. VERB 22 NOUN 01 Flashing		
n. 40000 ENTR		
55. Remove the jumper from J2-D of the Auxiliary Input panel and place it on J2-C to monitor MG +Δθ abort signal on the Oscilloscope.		
56. Set the sensitivities on the Oscilloscope Amplifier as follows:		
a. CHANNEL 2 to 5 MV/MM		
b. CHANNEL 4 to 0.2 V/CM		
c. CHANNEL 5 to 50 MV/MM.		

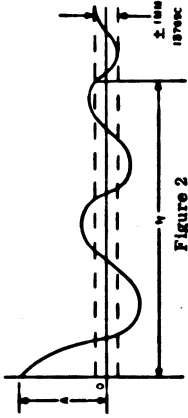
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SUBSYSTEM	LEM G & N SYSTEM	ASSY
62. Perform the following DSKY operations:		IG STEP RESPONSE
VERB 41 NOUN 20 ENTR		67. Apply the 10V step input to the IG TDA test input by connecting a jumper between TB6-27 of TPA #2 and TB2-11 of TPA #2.
VERB 21 NOUN 22 Flashing		
+00000 ENTR		68. Perform the following DSKY operations:
VERB 22 NOUN 22 Flashing		a. VERB 41 NOUN 20 ENTR
+00000 ENTR		b. Observe
VERB 23 NOUN 22 Flashing		VERB 21 NOUN 22 Flashing
+00000 ENTR		c. +00000 ENTR
VERB 41 NOUN 22 Displayed		d. Observe
63. Set the following controls on the Oscilloscope Signal Selector panel to monitor the associated signals:		VERB 22 NOUN 22 Flashing
CHANNEL Position	Signal	e. +00000 ENTR
a. 1-3	IG & Y Gyro Error Signal	f. Observe
b. 2-2	MG Error Signal	VERB 23 NOUN 22 Flashing
c. 3-2	OG Error Signal	g. +00000 ENTR
64. Insure that CH3AC pushbutton on the Oscilloscope Signal Selector panel is lit.		h. Observe
65. Press the CHART SPEEDS 200 pushbutton on the Oscilloscope Control panel and set the following channel sensitivities on the Oscilloscope Amplifier panel:		VERB 41 NOUN 22 Displayed
Channel	Sensitivity	i. VERB 36 ENTR
a. 1	50 MV/MM	
b. 2	10 MV/MM	
c. 3	10 MV/MM	
66. Set the PHASE SHIFT SELECTOR on the Phase Sensitive Demodulators of CHANNELS 1, 2 and 3 to 3200 ~ 0 deg. Set FILTER switches to HI.		69. Set and hold SERVO TEST switch on TPA #2 in the ON position and adjust CAL ADJ control on CHANNEL 1 Oscilloscope Amplifier to obtain a step input amplitude A (See figure 2) of 20 mm. Continue holding SERVO TEST switch to ON.
		70. Start Oscilloscope by setting CHART DRIVE switch on Oscilloscope Control panel to MM/SEC.
		71. After observing a constant servo error on CHANNEL 1 of Oscilloscope, release SERVO TEST switch. Observe Oscilloscope trace for an additional constant servo error then set CHART DRIVE switch to OFF.

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72. Deleted.
73. Determine and record the number of error signal oscillation peaks outside  $\pm 1$  mm of the final value. (See Figure 2.) Record magnitude A. Record the time  $t_f$  for the error signal to reach and stay within 1 mm of its final value.



- MG STEP RESPONSE
74. Set the following Channel sensitivities on the Oscilloscope Amplifier panel:
- | Channel | Sensitivity |
|---------|-------------|
| 1       | 10 MV/MM    |
| 2       | 30 MV/MM    |
| 3       | 10 MV/MM    |
75. Apply the 5V step input to the MG TDA test input by removing the jumper of step 67 and connecting it between TB5-18 of TPA #2 and TB2-10 of TPA #2.
76. Perform the following DSKY operations:

- | Channel | Sensitivity |
|---------|-------------|
| 1       | 10 MV/MM    |
| 2       | 10 MV/MM    |
| 3       | 20 MV/MM    |
77. Set and hold SERVO TEST switch on TPA #2 in the ON position and adjust CAL ADJ control on CHANNEL 2 Oscilloscope Amplifier to obtain a step input amplitude A (see figure 2) of 20 mm. Continue holding SERVO TEST switch to ON.
78. Start Oscilloscope by setting CHART DRIVE switch on Oscilloscope Control panel to MM/SEC.
79. After observing a constant servo error on CHANNEL 2 of Oscilloscope, release SERVO TEST switch. Observe Oscilloscope trace for an additional constant servo error then set CHART DRIVE switch to OFF.
80. Determine and record the number of error signal oscillation peaks outside  $\pm 1$  mm of the final value. (See Figure 2.) Record magnitude A. Record the time  $t_f$  for the error signal to reach and stay within 1 mm of its final value.

OG STEP RESPONSE

81. Set the following channel sensitivities on the Oscilloscope Amplifier panel:

- | Channel | Sensitivity |
|---------|-------------|
| 1       | 10 MV/MM    |
| 2       | 10 MV/MM    |
| 3       | 20 MV/MM    |

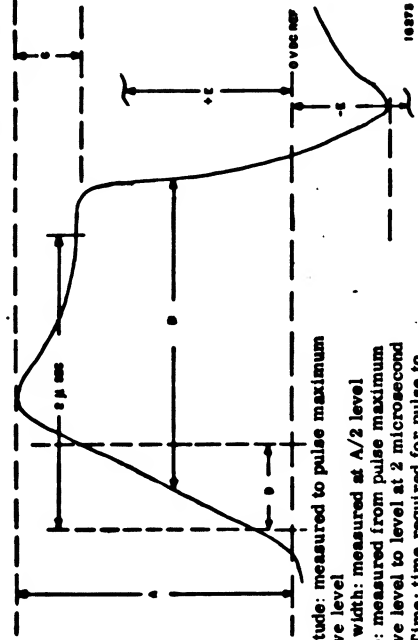
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82. Apply the 5V step input to the OG TDA test input by removing the jumper of step 75 and connecting it between TB5-18 of TPA #2 and TB2-4 of TPA #2.
83. Perform the following DSKY operations:

- | Channel | Sensitivity |
|---------|-------------|
| 1       | 10 MV/MM    |
| 2       | 10 MV/MM    |
| 3       | 20 MV/MM    |
84. Set and hold SERVO TEST switch on TPA #2 in the ON position and adjust CAL ADJ control on CHANNEL 3 Oscilloscope Amplifier to obtain a step input amplitude A (see figure 2) of 20 mm. Continue holding SERVO TEST switch to ON.
85. Start Oscilloscope by setting CHART DRIVE switch on Oscilloscope Control panel to MM/SEC.
86. After observing a constant servo error on CHANNEL 3 of Oscilloscope, release SERVO TEST switch. Observe Oscilloscope trace for an additional constant servo error then set CHART DRIVE switch to OFF.

87. Determine and record the number of error signal oscillation peaks outside  $\pm 1$  mm of the final value. (See Figure 2.) Record magnitude A. Record the time  $t_f$  for the error signal to reach and stay within 1 mm of its final value.
- NORMALIZATION OF SYSTEM
88. Perform the following DSKY operations:

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- A - Amplitude: measured to pulse maximum positive level
- B - Pulse width: measured at A/2 level
- C - Droop: measured from pulse maximum positive level to level at 2 microseconds
- D - Rise Time: time required for pulse to rise from 10% to 90% of A.
- E - Noise: (No pulse)

Figure 3. Waveform Description

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JDC  
NO. 12619  
REV J  
INITIAL TORR

ASSEMBLY UNDER TEST				TEST HISTORY			
TITLE	DWG	REV	DATE	START	END	SITE / LOCATION	
SER. NO.			TIME	START	END	TOTAL ELAPSED	
MAJOR GROUND SUPPORT EQUIPMENT							
CONDUCTED BY: NAME/AFFILIATION: APPROVED BY: NAME/AFFILIATION:							
NAME: SER. NO. CAL DATE							
NAME: SER. NO. CAL DATE							
JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
3	28 VDC Bus voltage	vdc	27.75		28.25		
6.a	OG Error signal	mv			60		
6.b	MG Error signal	mv			60		
6.c	IG Error signal	mv			60		
6.d	X Gyro Error signal	mv			60		
6.e	Z Gyro Error signal	mv			60		
7.a	Total OG TDA	volts			10		
7.b	Total MG TDA	volts			10		
7.c	Total IG TDA	volts			10		
16	OG - $\Delta$ abort	Refer to fig 3					
16.a.A	Amplitude	peak volts	4		10		
16.a.B	Pulse width	sec	2		4		
16.a.C	Droop	volts			$\frac{A}{5}$		
16.a.D	Rise Time	sec			0.5		

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APOLLO G&N  
EQUIPMENT TEST  
DATA SHEET 2 OF 4

JDC  
NO. 12619  
REV. J

JOB GIMBAL RESPONSE TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ ACC
16.a.E	Noise with respect to 0 vdc reference	volts	-4.0		+4.0	
16.b	IRIG PVR	vdc				
16.c	IRIG Torque	vdc				
16.d	IRIG SF voltage	vdc				
23	OG + Δθ abort	Refer to fig 3				
23.A	Amplitude	peak volts	4		10	
23.B	Pulse width	μsec	2		4	
23.C	Droop	volts			$\frac{A}{5}$	
23.D	Rise Time	μsec			0.5	
23.E	Noise with respect to 0 vdc reference	volts	-4.0		+4.0	
24	OG CDU Fine	volt	-0.070		+0.070	
24	Error on CH3	rms				
24	OG TM Current on CH4	amps	-0.125		+0.125	
24	OG CDU Coarse	volt	-0.680		+0.680	
24	Error on CH5	rms				
34	IG - Δθ abort	Refer to fig 3				
34.A	Amplitude	peak volts	4		10	
34.B	Pulse width	μsec	2		4	
34.C	Droop	volts			$\frac{A}{5}$	
34.D	Rise Time	μsec			0.5	

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FORM 9017  
GPO 7-64000

APOLLO G&N  
EQUIPMENT TEST  
DATA SHEET 3 OF 4

JDC  
NO. 12619  
REV. J

JOB GIMBAL RESPONSE TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ ACC
34.E	Noise with respect to 0 vdc reference	volts	-4.0		+4.0	
41	IG + Δθ abort	Refer to fig 3				
41.A	Amplitude	peak volts	4		10	
41.B	Pulse width	μsec	2		4	
41.C	Droop	volts			$\frac{A}{5}$	
41.D	Rise Time	μsec			0.5	
41.E	Noise with respect to 0 vdc reference	volts	-4.0		+4.0	
42	IG CDU Fine	volt	-0.070		+0.070	
42	Error on CH1	rms				
42	IG TM Current on CH4	amps	-0.125		+0.125	
42	IG CDU Coarse	volt	-0.680		+0.680	
42	Error on CH5	rms				
52	MG - Δθ abort	Refer to fig 3				
52.A	Amplitude	peak volts	4		10	
52.B	Pulse width	μsec	2		4	
52.C	Droop	volts			$\frac{A}{5}$	
52.D	Rise Time	μsec			0.5	
52.E	Noise with respect to 0 vdc reference	volts	-4.0		+4.0	
59	MG + Δθ abort	Refer to fig 3				

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FORM 9017  
GPO 7-64000

APOLLO G&N  
EQUIPMENT TEST  
DATA SHEET 4 OF 4

JDC  
NO. 12619  
REV. J

JOB GIMBAL RESPONSE TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ ACC
59.A	Amplitude	peak volts	4		10	
59.B	Pulse width	μsec	2		4	
59.C	Droop	volts			$\frac{A}{5}$	
59.D	Rise Time	μsec			0.5	
59.E	Noise with respect to 0 vdc reference	volts	-4.0		+4.0	
60	MG CDU Fine	volt	-0.070		+0.070	
60	Error on CH2	rms				
60	MG TM Current on CH4	amps	-0.125		+0.125	
60	MG CDU Coarse	volt	-0.680		+0.680	
60	Error on CH5	rms				
73	Oscillation peaks				3	
	Magnitude A	mm				
	t <sub>f</sub>	ms			100	
80	Oscillation peaks				3	
	Magnitude A	mm				
	t <sub>f</sub>	ms			100	
87	Oscillation peaks				5	
	Magnitude A	mm				
	t <sub>f</sub>	ms			100	
	AGC Displays	All DSKY displays and indications reacted as specified				

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SUBSYSTEM LEM G & N SYSTEM

DESCRIPTION A gimbal friction test is performed by driving the Outer and Inner gimbals through plus and minus 360°, one at a time, and the Middle gimbal through 135°. During the slow periods the Fine and Coarse CDU errors and gimbal torque motor current are monitored on the Oscillograph. In addition the plus and minus 360° abort signal characteristics are checked during each gimbal slew. After the gimbal friction test the OG, MG and IG stab loop responses are tested by providing a step input to each DC Stab Amp.

Rev.	Date	TORR	PAGES REVISED	APPROVAL	REFERENCES
A	7-3-66	30246	1-7	2	MM, NAS
B	7-21-66	30243	2, 4, 6-9	1	EA, M, M
C	9-5-66	30522	2, 4, 6-9	1	EA, M, M
D	9-18-66	30702	2, 3	1	EA, M, M
E	11-10-66	31903	2, 3	1	EA, M, M
F	12-27	32605	2	1	EA, M, M
G	1-18-67	32608	2	1	EA, M, M
H	2-2-67	32859	1-4, 6-9	1	EA, M, M
I	11-30-67	35183	1-4, 6-9	1	EA, M, M
J	1-25-68	35482	2-10	1	EA, M, M

INITIALIZATION

1. Perform JDC 12613 to establish a Master Initialization condition.
2. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 173.
3. Measure the 28 VDC Bus voltage indicated on the DVM. Record the indication.
4. Insure that the Inner, Middle and Outer gimbals are set to approximately 0.0° as

Indicated on the Gimbal Position Control panel.

If not, perform the following DSKY operations:

- a. VERB 41 NOUN 20 ENTR
- b. Observe VERB 21 NOUN 22 Flashing ENTR
- c. +00000
- d. Observe VERB 22 NOUN 22 Flashing ENTR
- e. +00000

VERIFICATION WITH SDC REQUIRED BEFORE USE

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ASSY

- f. Observe VERB 23 NOUN 22 Flashing ENTR
  - g. +00000
  - h. Observe VERB 41 NOUN 22 Displayed ENTR
  - i. VERB 36
  - j. Perform the following DSKY operations:
    - a. VERB 21 NOUN 01 ENTR
    - b. 00370
    - c. 16002
- STATIC LOOP PARAMETERS
6. Connect the 28V 3200 cps feedback signal to Dual Beam Oscilloscope by setting CROSSBAR CONTROL on Primary Signal Selector panel to 123.
  7. Set REFERENCE switch to 4.
  8. Adjust PHASE GENERATOR 3200 CPS control on Oscillograph Signal Selector panel until phase shift of signal on Dual Beam Oscilloscope is zero. (This condition can be obtained at two positions of PHASE GENERATOR 3200 CPS control. Choose the position closest to 0°.)
  9. Record value of phase shift indicated on PHASE GENERATOR 3200 CPS readout.
  10. Connect IG error signal to Dual Beam Oscilloscope by setting CROSSBAR CONTROL on Primary Signal Selector panel to 135.
  11. Set Signal Generator for a square wave of full amplitude and 0.01 cps.
  12. Set Gimbal Servo Test selector on Test Selector panel to 1.
13. Apply square wave input to IG loop by pressing TEST START pushbutton on Test Selector panel.
  14. Adjust PHASE GENERATOR 3200 CPS control on Oscillograph Signal Selector panel until phase shift of signal on Dual Beam Oscilloscope is zero. (This condition can be obtained at two positions of the PHASE GENERATOR 3200 CPS control. Choose the position closest to 270°.)
  15. Record value of phase shift indicated on PHASE GENERATOR 3200 CPS readout.
  16. When signal on Dual Beam Oscilloscope changes phase, adjust PHASE GENERATOR 3200 CPS control on Oscillograph Signal Selector panel until phase shift of signal on Dual Beam Oscilloscope is zero. (This condition can be obtained at two positions of the PHASE GENERATOR 3200 CPS control. Choose the position closest to 270°.)
  17. Record value of phase shift indicated on PHASE GENERATOR 3200 CPS readout.
  18. Remove input from IG loop by pressing TEST STOP pushbutton on Test Selector panel.
  19. Calculate the average of the values obtained in steps 15 and 17. Subtract the value recorded in step 9 from the average and record result.
  20. Set PAYM to the phase angle value recorded in step 19.
  21. Read and record the voltage indicated on PAYM as the IG error in-phase null.

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ASSY

22. Repeat steps 10 through 20 using Gimbal Servo Test position 2 and CROSSBAR CONTROL position 134.
  23. Read and record the voltage indicated on PAYM as the MG error in-phase null.
  24. Repeat steps 10 through 20 using Gimbal Servo Test position 3 and CROSSBAR CONTROL position 133.
  25. Read and record the voltage indicated on PAYM as the OG error in-phase null.
  26. Set the Primary Signal Selector panel to monitor the following signals on the PAYM. Record the total value of each:

Voltage	CROSSBAR CONTROL
a. OG TDA	136
b. MG TDA	137
c. IG TDA	138
  27. Perform the following DSKY operations:
    - a. VERB 41 NOUN 20 ENTR
    - b. VERB 21 NOUN 22 Flashing ENTR
    - c. +00000
    - d. VERB 23 NOUN 22 Flashing ENTR
    - e. +00000
    - f. VERB 23 NOUN 22 Flashing ENTR
    - g. +00000
    - h. VERB 41 NOUN 22 Displayed
    - i. VERB 24 NOUN 01 ENTR
    - j. 00403
28. Set CHANNEL 3 on Oscillograph Signal Selector panel to 8 and CHANNEL 4 and 5 to 15 and monitor the following signals:
- a. OG CDU Fine Error on CHANNEL 3
  - b. OG TM current on CHANNEL 4
  - c. OG CDU Coarse Error on CHANNEL 5.

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ASSY

- b. IRIG PVR (PIPA & IRIG SF MONITOR Selector switch on TPA #1 to position 10) on the Current Source Monitor per JDC 18016
  - c. IRIG Torque Current Monitor (PIPA & IRIG SF MONITOR Selector switch on TPA #1 to position 11) on the Current Source Monitor per JDC 18016
  - d. IRIG Scale Factor (PIPA & IRIG SF MONITOR Selector switch on TPA #1 to position 12) on the Current Source Monitor per JDC 18016.
  35. When the Outer Gimbal Indicator on the Gimbal Position Control panel appears to stop, stop the Oscillograph. Set all sensitivities on the Oscillograph to OFF.
- +OG FRICTION TEST
36. Perform the following DSKY operations:
    - a. VERB 41 NOUN 20 ENTR
    - b. VERB 21 NOUN 22 Flashing ENTR
    - c. +00000
    - d. VERB 23 NOUN 22 Flashing ENTR
    - e. +00000
    - f. VERB 23 NOUN 22 Flashing ENTR
    - g. +00000
    - h. VERB 41 NOUN 22 Displayed
    - i. VERB 24 NOUN 01 ENTR
    - j. 00403
    - k. VERB 21 NOUN 01 Flashing
    - l. 40000
    - m. VERB 23 NOUN 01 Flashing
    - n. 40077
- NOTE: Insure that cable W65 plug P1 is connected to jack J4 on Current Source Monitor panel and that cable W65 plug P2 is connected to jack J15 on TPA #1.
30. Insure that CH3AC, CH4DC and CH5AC pushbuttons on the Oscillograph Signal Selector panel are lighted. Insure that the PHASE SHIFT SELECTOR switches on the Oscillograph Phase Sensitive Demodulators for CHANNELS 1, 2, 3, and 5 are set to the 800~0 DEG position and the FILTER switches are set to LO.
  31. Set the sensitivities on the Oscillograph Amplifier as follows:
    - a. CHANNEL 3 to 5 MV/MM
    - b. CHANNEL 4 to 0.2 V/CM
    - c. CHANNEL 5 to 50 MV/MM.
  32. Press CHART SPEEDS 1 pushbutton on the Oscillograph Control panel and set CHART DRIVE switch to MM/SEC.
  33. Perform the following DSKY operations:
    - a. VERB 42 ENTR
    - b. VERB 33 ENTR
- NOTE: If the measurements in step 34 cannot be completed before pulse to require end, repeat steps 27 and 33 and complete measurements not taken.
34. Measure and record the following signals:
    - a. Scope indications A through E (figure 3)
- NOTE: Insure that cable W65 plug P1 is connected to jack J4 on Current Source Monitor panel and that cable W65 plug P2 is connected to jack J15 on TPA #1.

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ASSY

37. Remove jumper from J2-F of the Auxiliary Input panel and place it on J2-E to monitor OG + Δθ short signal on the oscilloscope.

38. Set the sensitivities on the Oscillograph Amplifier as follows:

- a. CHANNEL 3 to 5 MV/MM.
  - b. CHANNEL 4 to 0.2 V/CM
  - c. CHANNEL 5 to 50 MV/MM.
39. Press CHART SPEEDS 1 pushbutton on the Oscillograph Control panel and set CHART DRIVE switch to MM/SEC.
40. Perform the following DSKY operations:

VERB 42 ENTR

VERB 33 ENTR

41. Measure and record the oscilloscope indication of A through E as represented on figure 3.

42. When the Outer Gimbal Indicator on the Gimbal Position Control panel appears to stop, stop the Oscillograph and record the maximum amplitude (neglect spikes) of CHANNELS 3 and 5. Using the equation given in Figure 1, calculate from the Oscillograph chart the maximum amplitude of CHANNEL 4. Record on data sheet. Set all sensitivities on the Oscillograph Amplifiers to OFF.



Figure 1

Where 0.2 is the Oscillograph sensitivity in volts per centimeter, and d is the deflection in centimeters measured from zero reference to the midpoint of trace. Ignore any noise spikes.

-IG FRICTION TEST

43. Perform the following DSKY operations:

- a. VERB 41 NOUN 20 ENTR
- b. VERB 21 NOUN 22 Flashing
- c. +00000 ENTR
- d. VERB 22 NOUN 22 Flashing
- e. +00000 ENTR
- f. VERB 23 NOUN 22 Flashing
- g. +00000 ENTR
- h. VERB 41 NOUN 22 Displayed
- i. VERB 24 NOUN 01 ENTR
- j. 00405 ENTR
- k. VERB 21 NOUN 01 Flashing
- l. 37777 ENTR
- m. VERB 22 NOUN 01 Flashing
- n. 37743 ENTR

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SUBSYSTEM LEM G & N SYSTEM

ASSY

44. Remove the jumper from J2-E of Auxiliary Input panel and place it on J2-B to monitor IG -Δθ short signal on the scope.

45. Remove the jumper from TB1 45 of TPA #2 and place it on TB 2-31 of TPA #2.

46. Remove the jumper TB 2-35 and place it on TB 2-47 of TPA #2.

47. Set CHANNEL 1 on the Oscillograph Signal Selector panel to 5 and CHANNEL 4 and 5 to 15 and monitor the following signals:

- a. IG CDU Fine Error on CHANNEL 1
  - b. IG TM Current on CHANNEL 4
  - c. IG CDU Coarse Error on CHANNEL 5.
48. Insure that CH4DC and CH5AC pushbuttons on the Oscillograph Signal Selector panel are lighted.

49. Set the sensitivities on the Oscillograph Amplifier as follows:

- a. CHANNEL 1 to 5 MV/MM
- b. CHANNEL 4 to 0.2 V/CM
- c. CHANNEL 5 to 50 MV/MM

50. Press CHART SPEEDS 1 pushbutton on the Oscillograph Control panel and set CHART DRIVE switch to MM/SEC.

51. Perform the following DSKY operations:

VERB 42 ENTR

VERB 33 ENTR

52. Measure and record the oscilloscope indications of A through E as represented on figure 3.

53. When the Inner Gimbal Indicator on the Gimbal Position Control panel appears

to stop, stop the Oscillograph. Set all sensitivities on the Oscillograph to OFF.

+IG FRICTION TEST

54. Perform the following DSKY operations:

- a. VERB 41 NOUN 20 ENTR
- b. VERB 21 NOUN 22 Flashing
- c. +00000 ENTR
- d. VERB 22 NOUN 22 Flashing
- e. +00000 ENTR
- f. VERB 23 NOUN 22 Flashing
- g. +00000 ENTR
- h. VERB 41 NOUN 22 Displayed
- i. VERB 24 NOUN 01 ENTR
- j. 00405 ENTR
- k. VERB 21 NOUN 01 Flashing
- l. 40000 ENTR
- m. VERB 22 NOUN 01 Flashing
- n. 40077 ENTR

55. Remove the jumper from J2-B of the Auxiliary Input panel and place it on J2-A to monitor IG + Δθ short signal on the oscilloscope.

56. Set the sensitivities on the Oscillograph Amplifier as follows:

- a. CHANNEL 1 to 5 MV/MM
- b. CHANNEL 4 to 0.2 V/CM
- c. CHANNEL 5 to 50 MV/MM.

57. Press CHART SPEEDS 1 pushbutton on the Oscillograph Control panel and set CHART DRIVE switch to MM/SEC.

58. Perform the following DSKY operations:

VERB 42 ENTR

VERB 33 ENTR

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SUBSYSTEM LEM G & N SYSTEM

ASSY

59. Measure and record the oscilloscope indications of A through E as represented on figure 3.

60. When the Inner Gimbal Indicator on the Gimbal Position Control panel appears to stop, stop the Oscillograph and record the maximum amplitude (neglect spikes) of CHANNELS 1 and 5. Using the equation given in Figure 1, calculate the maximum amplitude of CHANNEL 4. Record on data sheet. Set all sensitivities on the Oscillograph Amplifiers to OFF.

-MG FRICTION TEST

61. Perform the following DSKY operations:

- a. VERB 41 NOUN 20 ENTR
- b. VERB 21 NOUN 22 Flashing
- c. +00000 ENTR
- d. VERB 22 NOUN 22 Flashing
- e. +00000 ENTR
- f. VERB 23 NOUN 22 Flashing
- g. +06750 ENTR
- h. VERB 41 NOUN 22 Displayed
- i. VERB 24 NOUN 01 ENTR
- j. 00407 ENTR
- k. VERB 21 NOUN 01 Flashing
- l. 14000 ENTR
- m. VERB 22 NOUN 01 Flashing
- n. 00000 ENTR

62. Remove the jumper from J2-A of the Auxiliary Input panel and place it on J2-D to monitor MG -Δθ short signal on the oscilloscope.

63. Remove the jumper from TB 2-31 and place it on TB 2-32 of TPA #2.

70. Measure and record the oscilloscope indication of A through E as represented on figure 3.

71. When the Middle Gimbal Indicator on the Gimbal Position Control panel appears to stop, stop the Oscillograph. Set all sensitivities on the Oscillograph to OFF.

+MG FRICTION TEST

72. Perform the following DSKY operations:

- a. VERB 41 NOUN 20 ENTR
- b. VERB 21 NOUN 22 Flashing
- c. +00000 ENTR
- d. VERB 22 NOUN 22 Flashing
- e. +00000 ENTR
- f. VERB 23 NOUN 22 Flashing
- g. -06750 ENTR
- h. VERB 41 NOUN 22 Displayed
- i. VERB 24 NOUN 01 ENTR
- j. 00407 ENTR
- k. VERB 21 NOUN 01 Flashing
- l. 63777 ENTR
- m. VERB 22 NOUN 01 Flashing
- n. 40000 ENTR

73. Remove the jumper from J2-D of the Auxiliary Input panel and place it on J2-C to monitor MG + Δθ short signal on the Oscilloscope.

74. Set the sensitivities on the Oscillograph Amplifier as follows:

- a. CHANNEL 2 to 5 MV/MM
- b. CHANNEL 4 to 0.2 V/CM
- c. CHANNEL 5 to 50 MV/MM.

75. Press CHART SPEEDS 1 pushbutton on the Oscillograph Control panel and set CHART DRIVE switch to MM/SEC.

76. Perform the following DSKY operations:

VERB 42 ENTR

VERB 33 ENTR

NOTE: Perform step 77 as quickly as possible as measurement time is limited to approximately 2 minutes. If measurement cannot be completed before pulse torquing ends turn the oscillograph off and repeat steps 72 and 76 and complete measurements not taken.

77. Measure and record the oscilloscope indications of A through E as represented in figure 3.

78. When the Middle Gimbal Indicator on the Gimbal Position Control panel appears to stop, stop the Oscillograph and record the maximum amplitude (neglect spikes) of CHANNELS 2 and 5 on the data sheets. Using the equation given in Figure 1, calculate from the Oscillograph chart the maximum amplitude of CHANNEL 4. Record on data sheet. Set all sensitivities on the Oscillograph Amplifiers to OFF.

79. Remove all jumper cables placed during this procedure.

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KG STEP RESPONSE

90. Perform the following DSKY operations:

VERB 41	NOUN 20	ENTR
VERB 21	NOUN 23	Flashing
+00000		ENTR
VERB 23	NOUN 23	Flashing
+00000		ENTR
VERB 23	NOUN 23	Flashing
+00000		ENTR
VERB 41	NOUN 23	Displayed

91. Set the following controls on the Oscilloscope Signal Selector panel to monitor the associated signals:

CHANNEL POSITION	SIGNAL
a. 1-2	IG & Y Gyro Error Signal
b. 2-3	MG Error Signal
c. 3-3	OG Error Signal

92. Insure that CHAC pushbutton on the Oscilloscope Signal Selector panel is lit.

93. Press the CHART SPEEDS 200 pushbutton on the Oscilloscope Control panel and set the following channel sensitivities on the Oscilloscope Amplifier panel:

Channel	Sensitivity
a. 1	50 MV/MM
b. 2	10 MV/MM
c. 3	10 MV/MM

94. Set the PHASE SHIFT SELECTOR on the Phase Sensitive Demodulators of CHANNELS 1, 2 and 3 to 3200 ~ 0 deg. Set FILTER switches to HI.

97. Set and hold SERVO TEST switch on TPA #2 in the ON position and adjust CAL ADJ control on CHANNEL 1 Oscilloscope Amplifier to obtain a step input amplitude A (see figure 2) of 20 mm. Continue holding SERVO TEST switch to ON.

98. Start Oscilloscope by setting CHART DRIVE switch on Oscilloscope Control panel to MM/SEC.

99. After observing a constant servo error on CHANNEL 1 of Oscilloscope, release SERVO TEST switch. Observe Oscilloscope trace for an additional constant servo error then set CHART DRIVE switch to OFF.

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90. Determine and record the number of error signal oscillation peaks outside  $\pm 1$  mm of the final value. (See Figure 2.) Record magnitude A. Record the time  $t_f$  for the error signal to reach and stay within 1 mm of its final value.

94. Set and hold SERVO TEST switch on TPA #2 in the ON position and adjust CAL ADJ control on CHANNEL 2 Oscilloscope Amplifier to obtain a step input amplitude A (see figure 2) of 20 mm. Continue holding SERVO TEST switch to ON.

95. Start Oscilloscope by setting CHART DRIVE switch on Oscilloscope Control panel to MM/SEC.

96. After observing a constant servo error on CHANNEL 2 of Oscilloscope, release SERVO TEST switch. Observe Oscilloscope trace for an additional constant servo error then set CHART DRIVE switch to OFF.

97. Determine and record the number of error signal oscillation peaks outside  $\pm 1$  mm of the final value. (See Figure 2.) Record magnitude A. Record the time  $t_f$  for the error signal to reach and stay within 1 mm of its final value.

98. Set the following channel sensitivities on the Oscilloscope Amplifier panel:

Channel	Sensitivity
a. 1	10 MV/MM
b. 2	20 MV/MM
c. 3	10 MV/MM

99. Perform the following DSKY operations:

VERB 41	NOUN 20	ENTR
VERB 21	NOUN 22	Flashing
+00000		ENTR
VERB 22	NOUN 22	Flashing
+00000		ENTR

100. Perform the following DSKY operations:

VERB 41	NOUN 20	ENTR
VERB 21	NOUN 22	Flashing
+00000		ENTR
VERB 22	NOUN 22	Flashing
+00000		ENTR

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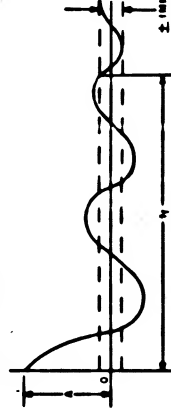


Figure 2

99. Apply the 5V step input to the OG TDA test input by removing the jumper of step 92 and connecting it between TB5-18 of TPA #2 and TB2-4 of TPA #2.

100. Perform the following DSKY operations:

VERB 41	NOUN 20	ENTR
VERB 21	NOUN 22	Flashing
+00000		ENTR
VERB 22	NOUN 22	Flashing
+00000		ENTR
VERB 23	NOUN 23	Flashing
+00000		ENTR
VERB 41	NOUN 23	Displayed
VERB 36		ENTR

101. Set and hold SERVO TEST switch on TPA #2 in the ON position and adjust CAL ADJ control on CHANNEL 3 Oscilloscope Amplifier to obtain a step input amplitude A (see figure 2) of 20 mm. Continue holding SERVO TEST switch to ON.

102. Start Oscilloscope by setting CHART DRIVE switch on Oscilloscope Control panel to MM/SEC.

103. After observing a constant servo error on CHANNEL 3 of Oscilloscope, release SERVO TEST switch. Observe Oscilloscope trace for an additional constant servo error then set CHART DRIVE switch to OFF.

104. Determine and record the number of error signal oscillation peaks outside  $\pm 1$  mm of the final value. (See Figure 2.) Record magnitude A. Record the time  $t_f$  for the error signal to reach and stay within 1 mm of its final value.

105. Perform the following DSKY operations:

VERB 36		ENTR
VERB 41	NOUN 20	ENTR
VERB 21	NOUN 22	Flashing
+00000		ENTR
VERB 22	NOUN 22	Flashing
+00000		ENTR
VERB 23	NOUN 22	Flashing
+00000		ENTR

106. Perform the following DSKY operations:

VERB 41	NOUN 20	ENTR
VERB 21	NOUN 22	Flashing
+00000		ENTR
VERB 22	NOUN 22	Flashing
+00000		ENTR
VERB 23	NOUN 22	Flashing
+00000		ENTR

107. Perform the following DSKY operations:

VERB 41	NOUN 20	ENTR
VERB 21	NOUN 22	Flashing
+00000		ENTR
VERB 22	NOUN 22	Flashing
+00000		ENTR
VERB 23	NOUN 22	Flashing
+00000		ENTR

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104. Determine and record the number of error signal oscillation peaks outside  $\pm 1$  mm of the final value. (See Figure 2.) Record magnitude A. Record the time  $t_f$  for the error signal to reach and stay within 1 mm of its final value.

105. Perform the following DSKY operations:

VERB 36		ENTR
VERB 41	NOUN 20	ENTR
VERB 21	NOUN 22	Flashing
+00000		ENTR
VERB 22	NOUN 22	Flashing
+00000		ENTR
VERB 23	NOUN 22	Flashing
+00000		ENTR

106. Perform the following DSKY operations:

VERB 41	NOUN 20	ENTR
VERB 21	NOUN 22	Flashing
+00000		ENTR
VERB 22	NOUN 22	Flashing
+00000		ENTR
VERB 23	NOUN 22	Flashing
+00000		ENTR

107. Perform the following DSKY operations:

VERB 41	NOUN 20	ENTR
VERB 21	NOUN 22	Flashing
+00000		ENTR
VERB 22	NOUN 22	Flashing
+00000		ENTR
VERB 23	NOUN 22	Flashing
+00000		ENTR

108. Perform the following DSKY operations:

VERB 41	NOUN 20	ENTR
VERB 21	NOUN 22	Flashing
+00000		ENTR
VERB 22	NOUN 22	Flashing
+00000		ENTR
VERB 23	NOUN 22	Flashing
+00000		ENTR

109. Perform the following DSKY operations:

VERB 41	NOUN 20	ENTR
VERB 21	NOUN 22	Flashing
+00000		ENTR
VERB 22	NOUN 22	Flashing
+00000		ENTR
VERB 23	NOUN 22	Flashing
+00000		ENTR

110. Perform the following DSKY operations:

VERB 41	NOUN 20	ENTR
VERB 21	NOUN 22	Flashing
+00000		ENTR
VERB 22	NOUN 22	Flashing
+00000		ENTR
VERB 23	NOUN 22	Flashing
+00000		ENTR

111. Perform the following DSKY operations:

VERB 41	NOUN 20	ENTR
VERB 21	NOUN 22	Flashing
+00000		ENTR
VERB 22	NOUN 22	Flashing
+00000		ENTR
VERB 23	NOUN 22	Flashing
+00000		ENTR

112. Perform the following DSKY operations:

VERB 41	NOUN 20	ENTR
VERB 21	NOUN 22	Flashing
+00000		ENTR
VERB 22	NOUN 22	Flashing
+00000		ENTR
VERB 23	NOUN 22	Flashing
+00000		ENTR

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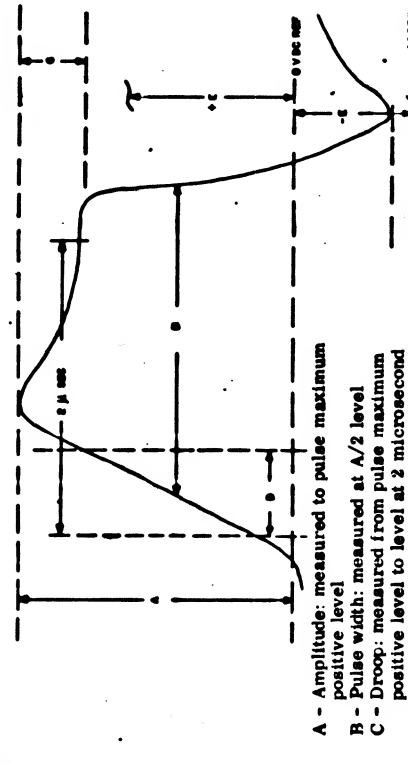


Figure 3. Waveform Description



APOLLO G&N  
EQUIPMENT TEST  
DATA SHEET 1 OF 6

JDC  
NO. 12619  
REV. K  
INITIAL TORR

JOB GIMBAL RESPONSE TEST

ASSEMBLY UNDER TEST		TEST HISTORY	
TITLE	DATE	START	END
SER. NO.	DWG	REV.	SITE / LOCATION
MAJOR GROUND SUPPORT EQUIPMENT		TIME	START
		END	TOTAL ELAPSED
NAME	SER. NO.	CAL DATE	
NAME	SER. NO.	CAL DATE	
CONDUCTED BY		APPROVED BY	
NAME/AFFILIATION		NAME/AFFILIATION	

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ/ACC
3	28 VDC Bus voltage	vdc	27.75		28.25	
9	PHASE GENER-ATOR 3200 CPS readout	deg				
15	PHASE GENER-ATOR 3200 CPS readout	deg				
17	PHASE GENER-ATOR 3200 CPS readout	deg				
19	IG error phase shift	deg				
21	IG error in-phase null	mV	-60		+60	

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APOLLO G&N  
EQUIPMENT TEST  
DATA SHEET 2 OF 6

JDC  
NO. 12619  
REV. K

JOB GIMBAL RESPONSE TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ/ACC
22(16)	PHASE GENER-ATOR 3200 CPS readout	deg				
22(17)	PHASE GENER-ATOR 3200 CPS readout	deg				
22(19)	MG error phase shift	deg				
22(21)	MG error in-phase null	mV	-60		+60	
24(16)	PHASE GENER-ATOR 3200 CPS readout	deg				
24(17)	PHASE GENER-ATOR 3200 CPS readout	deg				
24(19)	OG error phase shift	deg				
24(21)	OG error in-phase null	mV	-60		+60	
26.a	Total OG TDA	volts			10	
26.b	Total MG TDA	volts			10	
26.c	Total IG TDA	volts			10	

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APOLLO G&N  
EQUIPMENT TEST  
DATA SHEET 3 OF 6

JDC  
NO. 12619  
REV. K

JOB GIMBAL RESPONSE TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ/ACC
34	OG - $\Delta\theta$ abort	Refer to fig 3				
34.a.A	Amplitude	peak volts	4		10	
34.a.B	Pulse width	$\mu$ sec	2		4	
34.a.C	Droop	volts			$\frac{A}{5}$	
34.a.D	Rise Time	$\mu$ sec			0.5	
34.a.E	Noise with respect to 0 vdc reference	volts	-4.0		+4.0	
34.b	IRIG PVR	vdc				
34.c	IRIG Torque Current Monitor	vdc				
34.d	IRIG SF voltage	vdc				
41	OG + $\Delta\theta$ abort	Refer to fig 3				
41.A	Amplitude	peak volts	4		10	
41.B	Pulse width	$\mu$ sec	2		4	
41.C	Droop	volts			$\frac{A}{5}$	
41.D	Rise Time	$\mu$ sec			0.5	
41.E	Noise with respect to 0 vdc reference	volts	-4.0		+4.0	

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APOLLO G&N  
EQUIPMENT TEST  
DATA SHEET 4 OF 6

JDC  
NO. 12619  
REV. K

JOB GIMBAL RESPONSE TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ/ACC
42	OG CDU Fine Error on CH3	volt rms	-0.070		+0.070	
42	OG TM Current CH4	amps	-0.125		+0.125	
42	OG CDU Coarse Error on CH5	volt rms	-0.680		+0.680	
52	IG - $\Delta\theta$ abort	Refer to fig 3				
52.A	Amplitude	peak volts	4		10	
52.B	Pulse width	$\mu$ sec	2		4	
52.C	Droop	volts			$\frac{A}{5}$	
52.D	Rise Time	$\mu$ sec			0.5	
52.E	Noise with respect to 0 vdc reference	volts	-4.0		+4.0	
59	IG + $\Delta\theta$ abort	Refer to fig 3				
59.A	Amplitude	peak volts	4		10	
59.B	Pulse width	$\mu$ sec	2		4	
59.C	Droop	volts			$\frac{A}{5}$	
59.D	Rise Time	$\mu$ sec			0.5	
59.E	Noise with respect to 0 vdc reference	volts	-4.0		+4.0	

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APOLLO 6 & N  
EQUIPMENT TEST  
DATA SHEET 5 OF 6

JDC  
NO. 12612  
REV. K

JOB GIMBAL RESPONSE TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ/ACC
60	IG CDU Fine Error on CH1	volt rms	-0.070		+0.070	
60	IG TM Current on CH4	amps	-0.125		+0.125	
60	IG CDU Coarse Error on CH5	volt rms	-0.680		+0.680	
70	MG - $\Delta\theta$ abort	Refer to fig 3				
70.A	Amplitude	peak volts	4		10	
70.B	Pulse width	$\mu$ sec	2		4	
70.C	Droop	volts			$\frac{A}{5}$	
70.D	Rise Time	$\mu$ sec			0.5	
70.E	Noise with respect to 0 vdc reference	volts	-4.0		+4.0	
77	MG + $\Delta\theta$ abort	Refer to fig 3				
77.A	Amplitude	peak volts	4		10	
77.B	Pulse width	$\mu$ sec	2		4	
77.C	Droop	volts			$\frac{A}{5}$	
77.D	Rise Time	$\mu$ sec			0.5	
77.E	Noise with respect to 0 vdc reference	volts	-4.0		+4.0	

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APOLLO 6 & N  
EQUIPMENT TEST  
DATA SHEET 5 OF 6

JDC  
NO. 12612  
REV. K

JOB GIMBAL RESPONSE TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ/ACC
78	MG CDU Fine Error on CH2	volt rms	-0.070		+0.070	
78	MG TM Current on CH4	amps	-0.125		+0.125	
78	MG CDU Coarse Error on CH5	volt rms	-0.680		+0.680	
90	Oscillation peaks				3	
	Magnitude A	mm				
	$t_f$	ms			100	
97	Oscillation peaks				3	
	Magnitude A	mm				
	$t_f$	ms			100	
104	Oscillation peaks				5	
	Magnitude A	mm				
	$t_f$	ms			100	
	AGC Displays	All DSKY displays and indications reacted as specified				

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SUBSYSTEM LEM G & N SYSTEM

DESCRIPTION A gimbal friction test is performed by driving the Outer and Inner gimbals through plus and minus 360°, one at a time, and the Middle gimbal through 135°. During the slow periods the Fine and Coarse CDU errors and gimbal torque motor current are monitored on the Oscilloscope. In addition the plus and minus Δθ abort signal characteristics are checked during each gimbal slew. After the gimbal friction test the OG, MG and IG stab loop responses are tested by providing a step input to each DC Stab Amp.

Rev.	Date	TORR NO.	PAGES REVISED	APPROVAL	REFERENCES
A	7-5-66	30046	1-7	M. J. NAS	PS 6015000
B	7-21-66	30274	2	M. J. NAS	
C	8-5-66	30522	2, 4, 6-9	E. A. J.	
D	8-16-66	30702	1	E. A. J.	IMPORTANT: Insure that connector assembly (2003099) is connected to the LGC test connector.
E	11-10-66	31903	2, 3	E. A. J.	INTERVAL
F	1-12-67	32605	2	E. A. J.	
G	1-16-67	32688	2	E. A. J.	TOOLS AND MATERIAL
H	2-2-67	32689	All	E. A. J.	
I	11-30-67	35183	1, 4, 6-9	All	EA/02
J	1-25-68	35482	2-10	All	EA/02
K	1-25-68	35482	2-10	All	EA/02
L	3-26-68	35978	4-11	2	EA/02

INITIALIZATION

1. Perform JDC 12613 to establish a Master Initialization condition.
2. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 173.
3. Measure the 28 VDC Bus voltage indicated on the DVM. Record the indication.
4. Insure that the Inner, Middle and Outer gimbals are set to approximately 0.0° as

Indicated on the Gimbal Position Control panel. If not, perform the following DSKY operations:

- a. VERB 41 NOUN 20 ENTR
- b. Observe VERB 21 NOUN 22 Flashing ENTR
- c. +00000
- d. Observe VERB 22 NOUN 22 Flashing ENTR
- e. +00000

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1. Observe VERB 23 NOUN 22 Flashing g. +00000 ENTR
  - b. Observe VERB 41 NOUN 22 Displayed 1. VERB 36 ENTR
  5. Perform the following DSKY operations:
    - a. VERB 21 NOUN 01 ENTR
    - b. 00370 ENTR
    - c. 16002 ENTR
- STATIC LOOP PARAMETERS
6. Connect the 28V 3200 cps feedback signal to Dual Beam Oscilloscope by setting CROSSBAR CONTROL on Primary Signal Selector panel to 123.
  7. Set REFERENCE switch to 4.
  8. Adjust PHASE GENERATOR 3200 CPS control on Oscilloscope Signal Selector panel until phase shift of signal on Dual Beam Oscilloscope is zero. (This condition can be obtained at two positions of PHASE GENERATOR 3200 CPS control. Choose the position closest to 0°.)
  9. Record value of phase shift indicated on PHASE GENERATOR 3200 CPS readout.
  10. Connect IG error signal to Dual Beam Oscilloscope by setting CROSSBAR CONTROL on Primary Signal Selector panel to 135.
  11. Set Signal Generator for a square wave of full amplitude and 0.01 cps.
  12. Set Gimbal Servo Test selector on Test Selector panel to 1.
13. Apply square wave input to IG loop by pressing TEST START pushbutton on Test Selector panel.
  14. Adjust PHASE GENERATOR 3200 CPS control on Oscilloscope Signal Selector panel until phase shift of signal on Dual Beam Oscilloscope is zero. (This condition can be obtained at two positions of the PHASE GENERATOR 3200 CPS control. Choose the position closest to 270°.)
  15. Record value of phase shift indicated on PHASE GENERATOR 3200 CPS readout.
  16. When signal on Dual Beam Oscilloscope changes phase, adjust PHASE GENERATOR 3200 CPS control on Oscilloscope Signal Selector panel until phase shift of signal on Dual Beam Oscilloscope is zero. (This condition can be obtained at two positions of the PHASE GENERATOR 3200 CPS control. Choose the position closest to 270°.)
  17. Record value of phase shift indicated on PHASE GENERATOR 3200 CPS readout.
  18. Remove input from IG loop by pressing TEST STOP pushbutton on Test Selector panel.
  19. Calculate the average of the values obtained in steps 15 and 17. Subtract the value recorded in step 9 from the average and record result.
  20. Set PAVM to the phase angle value recorded in step 19.
  21. Read and record the voltage indicated on PAVM as the IG error in-phase null.

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22. Repeat steps 10 through 20 using Gimbal Servo Test position 2 and CROSSBAR CONTROL position 134.
  23. Read and record the voltage indicated on PAVM as the MG error in-phase null.
  24. Repeat steps 10 through 20 using Gimbal Servo Test position 3 and CROSSBAR CONTROL position 133.
  25. Read and record the voltage indicated on PAVM as the OG error in-phase null.
  26. Set the Primary Signal Selector panel to monitor the following signals on the PAVM. Record the total value of each:

Voltage	CROSSBAR CONTROL
a. OG TDA	136
b. MG TDA	137
c. IG TDA	138
- OG FRICTION
- a. VERB 41 NOUN 20 ENTR
  - b. VERB 21 NOUN 22 Flashing
  - c. +00000 ENTR
  - d. VERB 22 NOUN 22 Flashing
  - e. +00000 ENTR
  - f. VERB 23 NOUN 22 Flashing
  - g. +00000 ENTR
  - h. VERB 41 NOUN 22 Displayed
  - i. VERB 24 NOUN 01 ENTR
  - j. 00403 ENTR
- k. VERB 21 NOUN 01 Flashing 1. 37777 ENTR
  - m. VERB 22 NOUN 01 Flashing n. 37743 ENTR
28. Place jumpers between the following points:
- |     |                    |                              |
|-----|--------------------|------------------------------|
| OG  | From               | To                           |
| AIP | DIRECT PROBES      | CHADC                        |
| AIP | OUTPUT             | BUFFERED PROBES              |
| AIP | OUTPUT             | OUTPUT                       |
| AIP | J2F (OG-Δθ Abort)  | J1-A (Scope B CH1 top 2)     |
| AIP | J4-F (coax jumper) | SCOPE A TRIGGER IN, (in AIP) |
- TPA #2 DIRECT PROBE TBI-46 (in AIP)
- TPA #2 BUFFERED PROBE TBI-46 (in AIP)
- TPA #2 PULSE PROBE TBI-4 (in AIP)
- TPA #2 PULSE PROBE TBI-9 (in AIP)
29. Set CHANNEL 3 on Oscilloscope Signal Selector panel to 5 and CHANNEL 4 and 5 to 15 and monitor the following signals:
- a. OG CDU Fine Error on CHANNEL 3
  - b. OG TM current on CHANNEL 4
  - c. OG CDU Coarse Error on CHANNEL 5.

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- b. IRIG PVR (PIPA & IRIG SF MONITOR Selector switch on TPA #1 to position 10) on the Current Source Monitor per JDC 18016
  - c. IRIG Torque Current Monitor (PIPA & IRIG SF MONITOR Selector switch on TPA #1 to position 11) on the Current Source Monitor per JDC 18016
  - d. IRIG Scale Factor (PIPA & IRIG SF MONITOR Selector switch on TPA #1 to position 12) on the Current Source Monitor per JDC 18016.
35. When the Outer Gimbal Indicator on the Gimbal Position Control panel appears to stop, stop the Oscilloscope. Set all sensitivities on the Oscilloscope to OFF.
- OG FRICTION TEST
36. Perform the following DSKY operations:

a. VERB 41 NOUN 20 ENTR	b. VERB 21 NOUN 22 Flashing
c. +00000 ENTR	d. VERB 22 NOUN 22 Flashing
e. +00000 ENTR	f. VERB 23 NOUN 22 Flashing
g. +00000 ENTR	h. VERB 41 NOUN 22 Displayed
i. VERB 24 NOUN 01 ENTR	j. 00403 ENTR
k. VERB 21 NOUN 01 Flashing	l. 40000 ENTR
m. VERB 22 NOUN 01 Flashing	n. 40077 ENTR

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SUBSYSTEM LEM G & N SYSTEM

ASSY

37. Remove jumper from J2-F of the Auxiliary Input panel and place it on J2-E to monitor OG + Δθ short signal on the oscilloscope.

38. Perform the following DSKY operations:

VERB 42 ENTR  
VERB 33 ENTR

39. Press CHART SPEEDS 1 pushbutton on the Oscillograph Control panel and set CHART DRIVE switch to MM/SEC.

40. Set the sensitivities on the Oscillograph Amplifier as follows:

a. CHANNEL 3 to 5 MV/MM  
b. CHANNEL 4 to 0.2 V/CM  
c. CHANNEL 5 to 50 MV/MM.

41. Measure and record the oscilloscope indication of A through E as represented on figure 3.

42. When the Outer Gimbal Indicator on the Gimbal Position Control panel appears to stop, stop the Oscillograph and record the maximum amplitude (neglect spikes) of CHANNELS 3 and 5. Using the equation given in Figure 1, calculate from the Oscillograph chart the maximum amplitude of CHANNEL 4. Record on data sheet. Set all sensitivities on the Oscillograph Amplifiers to OFF.

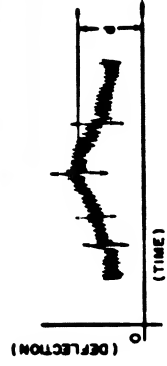


Figure 1  
Where 0.2 is the Oscillograph sensitivity in volts per centimeter, and d is the deflection in centimeters measured from zero reference to the midpoint of trace. Ignore any noise spikes.

-MG FRICTION TEST

43. Perform the following DSKY operations:

a. VERB 41 NOUN 20 ENTR  
b. VERB 21 NOUN 22 Flashing  
c. +00000 ENTR  
d. VERB 22 NOUN 22 Flashing  
e. +00000 ENTR  
f. VERB 23 NOUN 22 Flashing  
g. +00000 ENTR  
h. VERB 41 NOUN 22 Displayed  
i. VERB 24 NOUN 01 ENTR  
j. 00405 ENTR  
k. VERB 21 NOUN 01 Flashing  
l. 37777 ENTR  
m. VERB 22 NOUN 01 Flashing  
n. 37743 ENTR

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SUBSYSTEM LEM G & N SYSTEM

ASSY

44. Remove the jumper from J2-E of Auxiliary Input panel and place it on J2-B to monitor IG - Δθ short signal on the scope.  
45. Remove the jumper from TB1 45 of TPA #2 and place it on TB 2-31 of TPA #2.  
46. Remove the jumper TB 2-35 and place it on TB 2-47 of TPA #2.

47. Set CHANNEL 1 on the Oscillograph Signal Selector panel to 5 and CHANNEL 4 and 5 to 15 and monitor the following signals:

a. IG CDU Fine Error on CHANNEL 1  
b. IG TM Current on CHANNEL 4  
c. IG CDU Coarse Error on CHANNEL 5.  
48. Insure that CHADC and CHSAC pushbuttons on the Oscillograph Signal Selector panel are lighted.

49. Perform the following DSKY operations:

VERB 45 ENTR  
VERB 33 ENTR

50. Press CHART SPEEDS 1 pushbutton on the Oscillograph Control panel and set CHART DRIVE switch to MM/SEC.

51. Set the sensitivities on the Oscillograph Amplifier as follows:

a. CHANNEL 1 to 5 MV/MM  
b. CHANNEL 4 to 0.2 V/CM  
c. CHANNEL 5 to 50 MV/MM.

52. Measure and record the oscilloscope indications of A through E as represented on figure 3.

53. When the Inner Gimbal Indicator on the Gimbal Position Control panel appears

to stop, stop the Oscillograph. Set all sensitivities on the Oscillograph to OFF.  
+KG FRICTION TEST

54. Perform the following DSKY operations:

a. VERB 41 NOUN 20 ENTR  
b. VERB 21 NOUN 22 Flashing  
c. +00000 ENTR  
d. VERB 22 NOUN 22 Flashing  
e. +00000 ENTR  
f. VERB 23 NOUN 22 Flashing  
g. +00000 ENTR  
h. VERB 41 NOUN 22 Displayed  
i. VERB 24 NOUN 01 ENTR  
j. 00405 ENTR  
k. VERB 21 NOUN 01 Flashing  
l. 40000 ENTR  
m. VERB 22 NOUN 01 Flashing  
n. 40077 ENTR

55. Remove the jumper from J2-B of the Auxiliary Input panel and place it on J2-A to monitor IG + Δθ short signal on the oscilloscope.

56. Perform the following DSKY operations:

VERB 43 ENTR  
VERB 33 ENTR

57. Press CHART SPEEDS 1 pushbutton on the Oscillograph Control panel and set CHART DRIVE switch to MM/SEC.

58. Set the sensitivities on the Oscillograph Amplifier as follows:

a. CHANNEL 1 to 5 MV/MM  
b. CHANNEL 4 to 0.2 V/CM  
c. CHANNEL 5 to 50 MV/MM.

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SUBSYSTEM LEM G & N SYSTEM

ASSY

59. Measure and record the oscilloscope indications of A through E as represented on figure 3.

60. When the Inner Gimbal Indicator on the Gimbal Position Control panel appears to stop, stop the Oscillograph and record the maximum amplitude (neglect spikes) of CHANNELS 1 and 5. Using the equation given in Figure 1, calculate the maximum amplitude of CHANNEL 4. Record on data sheet. Set all sensitivities on the Oscillograph Amplifiers to OFF.

-MG FRICTION TEST

61. Perform the following DSKY operations:

a. VERB 41 NOUN 20 ENTR  
b. VERB 21 NOUN 22 Flashing  
c. +00000 ENTR  
d. VERB 22 NOUN 22 Flashing  
e. +00000 ENTR  
f. VERB 23 NOUN 22 Flashing  
g. +00750 ENTR  
h. VERB 41 NOUN 22 Displayed  
i. VERB 24 NOUN 01 ENTR  
j. 00407 ENTR  
k. VERB 21 NOUN 01 Flashing  
l. 14000 ENTR  
m. VERB 22 NOUN 01 Flashing  
n. 00000 ENTR

62. Remove the jumper from J2-A of the Auxiliary Input panel and place it on J2-D to monitor MG - Δθ short signal on the oscilloscope.

63. Remove the jumper from TB 2-31 and place it on TB 2-33 of TPA #2.

70. Measure and record the oscilloscope indication of A through E as represented on figure 3.

71. When the Middle Gimbal Indicator on the Gimbal Position Control panel appears to stop, stop the Oscillograph. Set all sensitivities on the Oscillograph to OFF.

-MG FRICTION TEST

72. Perform the following DSKY operations:

a. VERB 41 NOUN 20 ENTR  
b. VERB 21 NOUN 22 Flashing  
c. +00000 ENTR  
d. VERB 22 NOUN 22 Flashing  
e. +00000 ENTR  
f. VERB 23 NOUN 22 Flashing  
g. -00750 ENTR  
h. VERB 41 NOUN 22 Displayed  
i. VERB 24 NOUN 01 ENTR  
j. 00407 ENTR  
k. VERB 21 NOUN 01 Flashing  
l. 63777 ENTR  
m. VERB 22 NOUN 01 Flashing  
n. 40000 ENTR

73. Remove the jumper from J2-D of the Auxiliary Input panel and place it on J2-C to monitor MG + Δθ short signal on the oscilloscope.

74. Perform the following DSKY operations:

VERB 43 ENTR  
VERB 33 ENTR

75. Press CHART SPEEDS 1 pushbutton

on the Oscillograph Control panel and set CHART DRIVE switch to MM/SEC.

76. Set the sensitivities on the Oscillograph Amplifier as follows:

a. CHANNEL 3 to 5 MV/MM  
b. CHANNEL 4 to 0.2 V/CM  
c. CHANNEL 5 to 50 MV/MM.

NOTE: Perform step 77 as quickly as possible as measurement time is limited to approximately 3 minutes. If measurement cannot be completed before pulse torquing ends turn the oscillograph off and repeat steps 72 and 76 and complete measurements not taken.

77. Measure and record the oscilloscope indications of A through E as represented in figure 3.

78. When the Middle Gimbal Indicator on the Gimbal Position Control panel appears to stop, stop the Oscillograph and record the maximum amplitude (neglect spikes) of CHANNELS 3 and 5 on the data sheets. Using the equation given in Figure 1, calculate from the Oscillograph chart the maximum amplitude of CHANNEL 4. Record on data sheet. Set all sensitivities on the Oscillograph Amplifiers to OFF.

79. Remove all jumper cables placed during this procedure.

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90. Perform the following DSKY operations:		
VERB 41	NOUN 20	ENTR
VERB 21	NOUN 22	Flashing
+00000		ENTR
VERB 23	NOUN 22	Flashing
+00000		ENTR
VERB 23	NOUN 22	Flashing
+00000		ENTR
VERB 41	NOUN 22	Displayed
91. Set the following controls on the Oscilloscope Signal Selector panel to monitor the associated signals:		
CHANNEL POSITION		
Signal		
a.	1-2	KG & Y Gyro
Signal		
b.	2-2	Error Signal
Signal		
c.	3-2	OG Error Signal
92. Insure that CHAC pushbutton on the Oscilloscope Signal Selector panel is lit.		
93. Press the CHART SPEEDS 200 pushbutton on the Oscilloscope Control panel and set the following channel sensitivities on the Oscilloscope Amplifier panel:		
Channel Sensitivity		
a.	1	50 MV/MM
b.	2	10 MV/MM
c.	3	10 MV/MM
94. Perform the following DSKY operations:		
a.	VERB 41	NOUN 20 ENTR
b.	Observe	
VERB 21	NOUN 22	Flashing

SUBSYSTEM LEM G & N SYSTEM		ASSY
90. Determine and record the number of error signal oscillation peaks outside $\pm 1$ mm of the final value. (See Figure 2.) Record magnitude A. Record the time $t_f$ for the error signal to reach and stay within 1 mm of its final value.		
Figure 2		
91. Perform the following DSKY operations:		
a.	VERB 41	NOUN 20 ENTR
b.	Observe	
VERB 21	NOUN 22	Flashing
c.	+00000	ENTR
d.	Observe	
VERB 23	NOUN 22	Flashing
e.	+00000	ENTR
f.	Observe	
VERB 23	NOUN 22	Flashing
g.	+00000	ENTR
h.	Observe	
VERB 41	NOUN 22	Displayed
i.	VERB 36	ENTR
92. Apply the 5V step input to the MG TDA test input by removing the jumper of step 86 and connecting it between TB5-18 of TPA #2 and TB2-10 of TPA #2.		
OG STEP RESPONSE		
93. Perform the following DSKY operations:		
a.	VERB 41	NOUN 20 ENTR
b.	Observe	
VERB 21	NOUN 22	Flashing

SUBSYSTEM LEM G & N SYSTEM		ASSY
constant servo error then set CHART DRIVE switch to OFF.		
104. Determine and record the number of error signal oscillation peaks outside $\pm 1$ mm of the final value. (See Figure 2.) Record magnitude A. Record the time $t_f$ for the error signal to reach and stay within 1 mm of its final value.		
NORMALIZATION OF SYSTEM		
106. Perform the following DSKY operation:		
a.	VERB 36	ENTR
106. Perform the following DSKY operations:		
a.	VERB 41	NOUN 20 ENTR
b.	Observe	
VERB 21	NOUN 22	Flashing
c.	+00000	ENTR
d.	Observe	
VERB 22	NOUN 22	Flashing
e.	+00000	ENTR
f.	Observe	
VERB 23	NOUN 22	Flashing
g.	+00000	ENTR
101. Set and hold SERVO TEST switch on TPA #2 in the ON position and adjust CAL ADJ control on CHANNEL 3 Oscilloscope Amplifier to obtain a step input amplitude A (see figure 2) of 20 mm. Continue holding SERVO TEST switch to ON.		
102. Start Oscilloscope by setting CHART DRIVE switch on Oscilloscope Control panel to MM/SEC.		
103. After observing a constant servo error on CHANNEL 3 of Oscilloscope, release SERVO TEST switch. Observe Oscilloscope trace for an additional		

SUBSYSTEM LEM G & N SYSTEM		ASSY
Figure 3. Waveform Description		
A - Amplitude: measured to pulse maximum positive level		
B - Pulse width: measured at A/2 level		
C - Droop: measured from pulse maximum positive level to level at 2 microseconds		
D - Rise Time: time required for pulse to rise from 10% to 90% of A.		
E - Noise: (No pulse)		

APOLLO GSN  
EQUIPMENT TEST  
DATA SHEET 1 OF 6

JOB GIMBAL RESPONSE TEST

JDC  
NO. 12619  
REV. L  
INITIAL TDRR 27134

ASSEMBLY UNDER TEST		TEST HISTORY	
TITLE	DATE	START	END
SER. NO.	DWG	REV.	SITE / LOCATION
NAME		START	END
NAME		TOTAL ELAPSED	
MAJOR GROUND SUPPORT EQUIPMENT			
NAME	SER. NO.	CAL DATE	
NAME	SER. NO.	CAL DATE	
CONDUCTED BY		APPROVED BY	
NAME / AFFILIATION		NAME / AFFILIATION	

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ ACC
3	28 VDC Bus voltage	vdc	27.75		28.25	
9	PHASE GENER-ATOR 3200 CPS readout	deg				
15	PHASE GENER-ATOR 3200 CPS readout	deg				
17	PHASE GENER-ATOR 3200 CPS readout	deg				
19	IG error phase shift	deg				
21	IG error in-phase null	mv	-60		+60	

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EQUIPMENT TEST  
DATA SHEET 2 OF 6

JOB GIMBAL RESPONSE TEST

JDC  
NO. 12619  
REV. L

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ ACC
22(15)	PHASE GENER-ATOR 3200 CPS readout	deg				
22(17)	PHASE GENER-ATOR 3200 CPS readout	deg				
22(19)	MG error phase shift	deg				
23	MG error in-phase null	mv	-60		+60	
24(15)	PHASE GENER-ATOR 3200 CPS readout	deg				
24(17)	PHASE GENER-ATOR 3200 CPS readout	deg				
24(19)	OG error phase shift	deg				
25	OG error in-phase null	mv	-60		+60	
26.a	Total OG TDA	volts			10	
26.b	Total MG TDA	volts			10	
26.c	Total IG TDA	volts			10	

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EQUIPMENT TEST  
DATA SHEET 3 OF 6

JOB GIMBAL RESPONSE TEST

JDC  
NO. 12619  
REV. L

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ ACC
34	OG - Δθ abort	Refer to fig 3				
34.a.A	Amplitude	peak volts	4		10	
34.a.B	Pulse width	μsec	2		4	
34.a.C	Droop	volts			$\frac{\Delta}{5}$	
34.a.D	Rise Time	μsec			0.5	
34.a.E	Noise with respect to 0 vdc reference	volts	-4.0		+4.0	
34.b	IRIG FVR	vdc				
34.c	IRIG Torque Current Monitor	vdc				
34.d	IRIG SF voltage	vdc				
41	OG + Δθ abort	Refer to fig 3				
41.A	Amplitude	peak volts	4		10	
41.B	Pulse width	μsec	2		4	
41.C	Droop	volts			$\frac{\Delta}{5}$	
41.D	Rise Time	μsec			0.5	
41.E	Noise with respect to 0 vdc reference	volts	-4.0		+4.0	

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EQUIPMENT TEST  
DATA SHEET 4 OF 6

JOB GIMBAL RESPONSE TEST

JDC  
NO. 12619  
REV. L

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ ACC
42	OG CDU Fine Error on CH3	volt rms	-0.070		+0.070	
42	OG TM Current CH4	amps	-0.125		+0.125	
42	OG CDU Coarse Error on CH5	volt rms	-0.680		+0.680	
52	IG - Δθ abort	Refer to fig 3				
52.A	Amplitude	peak volts	4		10	
52.B	Pulse width	μsec	2		4	
52.C	Droop	volts			$\frac{\Delta}{5}$	
52.D	Rise Time	μsec			0.5	
52.E	Noise with respect to 0 vdc reference	volts	-4.0		+4.0	
59	IG + Δθ abort	Refer to fig 3				
59.A	Amplitude	peak volts	4		10	
59.B	Pulse width	μsec	2		4	
59.C	Droop	volts			$\frac{\Delta}{5}$	
59.D	Rise Time	μsec			0.5	
59.E	Noise with respect to 0 vdc reference	volts	-4.0		+4.0	

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EQUIPMENT TEST  
DATA SHEET 5 OF 6

JDC  
NO. 12619  
REV. L

JOB GIMBAL RESPONSE TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ/ACC
60	IG CDU Fine Error on CH1	volt rms	-0.070		+0.070	
60	IG TM Current on CH4	amps	-0.125		+0.125	
60	IG CDU Coarse Error on CH5	volt rms	-0.680		+0.680	
70	MG - Δφ abort	Refer to fig 3				
70.A	Amplitude	peak volts	4		10	
70.B	Pulse width	μ sec	2		4	
70.C	Droop	volts			$\frac{A}{5}$	
70.D	Rise Time	μ sec			0.5	
70.E	Noise with respect to 0 vdc reference	volts	-4.0		+4.0	
77	MG + Δφ abort	Refer to fig 3				
77.A	Amplitude	peak volts	4		10	
77.B	Pulse width	μ sec	2		4	
77.C	Droop	volts			$\frac{A}{5}$	
77.D	Rise Time	μ sec			0.5	
77.E	Noise with respect to 0 vdc reference	volts	-4.0		+4.0	

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EQUIPMENT TEST  
DATA SHEET 6 OF 6

JDC  
NO. 12619  
REV. L

JOB GIMBAL RESPONSE TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ/ACC
78	MG CDU Fine Error on CH2	volt rms	-0.070		+0.070	
78	MG TM Current on CH4	amps	-0.125		+0.125	
78	MG CDU Coarse Error on CH5	volt rms	-0.680		+0.680	
90	Oscillation peaks				3	
	Magnitude A	mm				
	t <sub>r</sub>	ms			100	
97	Oscillation peaks				3	
	Magnitude A	mm				
	t <sub>r</sub>	ms			100	
104	Oscillation peaks				5	
	Magnitude A	mm				
	t <sub>r</sub>	ms			100	
	AGC Displays	All DSKY displays and indications reacted as specified				

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SUBSYSTEM LEM G & N SYSTEM

DESCRIPTION A gimbal friction test is performed by driving the Outer and Inner gimbals through plus and minus 360° one at a time, and the Middle gimbal through 135°. During the slow periods the Fine and Coarse CDU errors and gimbal torque motor current are monitored on the Oscillograph. In addition the plus and minus Δφ abort signal characteristics are checked during each gimbal slew. After the gimbal friction test the OG, MG and IG stab loop responses are tested by providing a step input to each DC Stub Amp.

Rev	Date	TORR	PAGES REVISED	APPROVAL	REFERENCES
A	7-5-68	30046	1-7	2	PG 6015000
B	7-21-68	30073	2	2	PG 6015000
C	8-5-68	30522	2,4,6-9	1	PG 6015000
D	8-18-68	30702	2	1	PG 6015000
E	11-10-68	31003	2,3	1	PG 6015000
F	12-27	32605	2	1	PG 6015000
G	12-27	32668	2	1	PG 6015000
H	2-2-67	32889	All	1,4	PG 6015000
I	11-30-67	35183	1-4,6-9	All	PG 6015000
J	2-25-68	35482	2-10	All	PG 6015000
K	2-28-68	35978	4-11	2	PG 6015000
L	8-9-68	36048	2-4,7-9	2	PG 6015000

#### INITIALIZATION

1. Perform JDC 12613 to establish a Master Initialization condition.
2. Set the CROSSBAR CONTROL on the Primary Signal Selector panel to 175.
3. Measure the 28 VDC Bus voltage indicated on the DVM. Record the indication.
4. Insure that the Inner, Middle and Outer gimbals are set to approximately 0.0° as

Indicated on the Gimbal Position Control panel. If not, perform the following DSKY operations:

- a. VERB 41 NOUN 20 ENTR
- b. Observe VERB 21 NOUN 23 Flashing ENTR
- c. +00000
- d. Observe VERB 23 NOUN 23 Flashing ENTR
- e. +00000

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ASSY

- f. Observe VERB 23 NOUN 23 Flashing ENTR
- g. +00000
- h. Observe VERB 41 NOUN 23 Displayed ENTR
- i. VERB 36
- j. Perform the following DSKY operations:
  - a. VERB 21 NOUN 01 ENTR
  - b. 00370
  - c. 16002

#### STATIC LOOP PARAMETERS

- a. Connect the 28 V 3200 cps feedback signal to Dual Beam Oscilloscope by setting CROSSBAR CONTROL on Primary Signal Selector panel to 123.
- b. Set REFERENCE switch to 4.
- c. Adjust PHASE GENERATOR 3200 CPS control on Oscillograph Signal Selector panel until phase shift of signal on Dual Beam Oscilloscope is zero. (This condition can be obtained at two positions of the PHASE GENERATOR 3200 CPS control. Choose the position closest to 270°.)
- d. Record value of phase shift indicated on PHASE GENERATOR 3200 CPS readout.
- e. When signal on Dual Beam Oscilloscope changes phase, adjust PHASE GENERATOR 3200 CPS control on Oscillograph Signal Selector panel until phase shift of signal on Dual Beam Oscilloscope is zero. (This condition can be obtained at two positions of the PHASE GENERATOR 3200 CPS control. Choose the position closest to 270°.)
- f. Record value of phase shift indicated on PHASE GENERATOR 3200 CPS readout.
- g. Set CHANNEL 1 selector on Oscillograph Signal Selector panel to 3 to monitor the IG Error signal on the Oscillograph.
- h. Set SENSITIVITY control on Oscillograph Phase Sensitive Demodulator for CHANNEL 1 to 100 MV/MM and set PHASE SHIFT SELECTOR to VARIABLE.
- i. Adjust PHASE ADJUST screw on CHANNEL 1 Phase Sensitive Demodulator to obtain maximum peak-to-peak deflection of CHANNEL 1 pen.
- j. Set SENSITIVITY control for CHANNEL 1 to OFF.

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- 17E. Set CHANNEL 1 selector on Oscillograph Signal Selector panel to OFF.
18. Remove input from IG loop by pressing TEST STOP pushbutton on Test Selector panel.
19. Calculate the average of the values obtained in steps 15 and 17. Subtract the value recorded in step 9 from the average and record result.
- 19A. Connect IG Error signal to PAVM by setting CROSSBAR CONTROL on Primary Signal Selector panel to 135.
20. Set PAVM to the phase angle value recorded in step 19.
21. Read and record the voltage indicated on PAVM as the IG error in-phase null.
22. Repeat steps 10 through 20 using Gimbal Servo Test position 2 and CROSSBAR CONTROL position 134, and Oscillograph Signal Selector panel CHANNEL 2 position 2.
23. Read and record the voltage indicated on PAVM as the MG error in-phase null.
24. Repeat steps 10 through 20 using Gimbal Servo Test position 3 and CROSSBAR CONTROL position 133, and Oscillograph Signal Selector panel CHANNEL 3 position 2.
25. Read and record the voltage indicated on PAVM as the OG error in-phase null.
26. Set the Primary Signal Selector panel to monitor the following signals on the PAVM:

From	To
OG	DIRECT PROBES CHADC
AIP	OUTPUT
AIP	BUFFERED PROBES CHADC
AIP	OUTPUT
AIP	J2F (OG-Δφ Abort) J1-A (Scope B CH1 input)
AIP	J4-7 (coax jumper) SCOPE A TRIGGER IN (in AIP)

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- a. OG TDA TB1-45 (M) 45 (10)
- b. MG TDA TB1-35 (M) 35 (10)
- c. IG TDA TB1-5 (M) 5 (10)
- d. TB1-9 (M) 9 (10)

27. Perform the following DSKY operations:
  - a. VERB 41 NOUN 20 ENTR
  - b. VERB 21 NOUN 23 Flashing ENTR
  - c. +00000
  - d. VERB 23 NOUN 23 Flashing ENTR
  - e. +00000
  - f. VERB 23 NOUN 23 Flashing ENTR
  - g. +00000
  - h. VERB 41 NOUN 23 Displayed ENTR
  - i. VERB 24 NOUN 01 ENTR
  - j. 00403

- a. VERB 21 NOUN 01 Flashing ENTR
- b. 37777
- c. VERB 23 NOUN 01 Flashing ENTR
- d. 37743

28. Place jumpers between the following points:

From	To
OG	DIRECT PROBES CHADC
AIP	OUTPUT
AIP	BUFFERED PROBES CHADC
AIP	OUTPUT
AIP	J2F (OG-Δφ Abort) J1-A (Scope B CH1 input)
AIP	J4-7 (coax jumper) SCOPE A TRIGGER IN (in AIP)

29. Set CHANNEL 3 on Oscillograph Signal Selector panel to 5 and CHANNEL 4 and 5 to 15 and monitor the following signals:
  - a. OG CDU Fine Error on CHANNEL 3
  - b. OG TM current on CHANNEL 4
  - c. OG CDU Coarse Error on CHANNEL 5.

30. Insure that CHADC, CHADC and CHADC pushbuttons on the Oscillograph Signal Selector panel are latched. Insure that the PHASE SHIFT SELECTOR switches on the Oscillograph Phase Sensitive Demodulators for CHANNELS 1, 2, 3, and 5 are set to the 900 ~ 9 DEG position and the FILTER switches are set to LO.

31. Perform the following DSKY operations:
  - a. VERB 43 ENTR
  - b. VERB 23 ENTR

32. Press CHART SPEED 1 pushbutton on the Oscillograph Control panel and set CHART DRIVE switch to MM/SEC.

33. Set the sensitivities on the Oscillograph Amplifier as follows:
  - a. CHANNEL 3 to 5 MV/MM
  - b. CHANNEL 4 to 0.2 V/CM
  - c. CHANNEL 5 to 50 MV/MM.

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36. Perform the following DSKY operations:

- VERB 41 NOUN 20 ENTR
- VERB 21 NOUN 22 Flashing
- +00000 ENTR
- VERB 22 NOUN 22 Flashing
- +00000 ENTR
- VERB 23 NOUN 22 Flashing
- +00000 ENTR
- VERB 41 NOUN 22 Displayed
- VERB 24 NOUN 01 ENTR
- 00408 ENTR
- VERB 21 NOUN 01 Flashing
- 40000 ENTR
- VERB 23 NOUN 01 Flashing
- 40077 ENTR

37. Remove jumper from J2-F of the Auxiliary Input panel and place it on J2-E to monitor OG +Δθ short signal on the oscilloscope.

38. Perform the following DSKY operations:

- VERB 42 ENTR
- VERB 33 ENTR

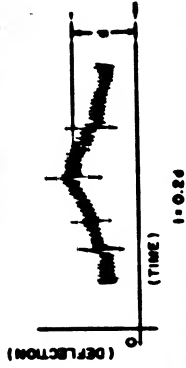
39. Press CHART SPEEDS 1 pushbutton on the Oscilloscope Control panel and set CHART DRIVE switch to MM/SEC.

40. Set the sensitivities on the Oscilloscope Amplifier as follows:

- CHANNEL 3 to 5 MV/MM
- CHANNEL 4 to 0.3 V/CM
- CHANNEL 5 to 50 MV/MM.

41. Measure and record the oscilloscope indication of A through E as represented on figure 3.

42. When the Outer Gimbal Indicator on the Gimbal Position Control panel appears to stop, stop the Oscilloscope and record the maximum amplitude (neglect spikes) of CHANNELS 3 and 5. Using the equation given in Figure 1, calculate from the Oscilloscope chart the maximum amplitude of CHANNEL 4. Record on data sheet. Set all sensitivities on the Oscilloscope Amplifier to OFF.



Where 0.2 is the Oscilloscope sensitivity in volts per centimeter, and d is the deflection in centimeters measured from zero reference to the midpoint of trace. Ignore any noise spikes.

36. Perform the following DSKY operations:

- VERB 41 NOUN 20 ENTR
- VERB 21 NOUN 22 Flashing
- +00000 ENTR
- VERB 23 NOUN 22 Flashing

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51. Set the sensitivities on the Oscilloscope Amplifier as follows:

- CHANNEL 1 to 5 MV/MM
- CHANNEL 4 to 0.3 V/CM
- CHANNEL 5 to 50 MV/MM

52. Measure and record the oscilloscope indications of A through E as represented on figure 3.

53. When the Inner Gimbal Indicator on the Gimbal Position Control panel appears to stop, stop the Oscilloscope. Set all sensitivities on the Oscilloscope to OFF.

54. Perform the following DSKY operations:

- VERB 41 NOUN 20 ENTR
- VERB 21 NOUN 22 Flashing
- +00000 ENTR
- VERB 22 NOUN 22 Flashing
- +00000 ENTR
- VERB 23 NOUN 22 Flashing
- +00000 ENTR
- VERB 41 NOUN 22 Displayed
- VERB 24 NOUN 01 ENTR
- 00408 ENTR
- VERB 21 NOUN 01 Flashing
- 40000 ENTR
- VERB 23 NOUN 01 Flashing
- 40077 ENTR

55. Remove the jumper from J2-B of the Auxiliary Input panel and place it on J2-A to monitor IG +Δθ short signal on the oscilloscope.

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56. Perform the following DSKY operations:

- VERB 43 ENTR
- VERB 33 ENTR

57. Press CHART SPEEDS 1 pushbutton on the Oscilloscope Control panel and set CHART DRIVE switch to MM/SEC.

58. Set the sensitivities on the Oscilloscope Amplifier as follows:

- CHANNEL 1 to 5 MV/MM
- CHANNEL 4 to 0.3 V/CM
- CHANNEL 5 to 50 MV/MM.

59. Measure and record the oscilloscope indications of A through E as represented on figure 3.

60. When the Inner Gimbal Indicator on the Gimbal Position Control panel appears to stop, stop the Oscilloscope and record the maximum amplitude (neglect spikes) of CHANNELS 1 and 5. Using the equation given in Figure 1, calculate the maximum amplitude of CHANNEL 4. Record on data sheet. Set all sensitivities on the Oscilloscope Amplifier to OFF.

56. Perform the following DSKY operations:

- VERB 41 NOUN 20 ENTR
- VERB 21 NOUN 22 Flashing
- +00000 ENTR
- VERB 22 NOUN 22 Flashing
- +00000 ENTR
- VERB 23 NOUN 22 Flashing
- +00710 ENTR
- VERB 41 NOUN 22 Displayed
- VERB 24 NOUN 01 ENTR

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ASSY

NOTE: Perform step 76 as quickly as possible as measurement time is limited to approximately 4 minutes. If measurement cannot be completed before pulse torquing ends, perform step 71, repeat steps 61 and 67, and then complete measurements not taken.

76. Measure and record the oscilloscope indication of A through E as represented on figure 3.

77. When the Middle Gimbal Indicator on the Gimbal Position Control panel appears to stop, stop the Oscilloscope. Set all sensitivities on the Oscilloscope to OFF.

78. Measure and record the oscilloscope indications of A through E as represented on figure 3.

79. Press CHART SPEEDS 1 pushbutton on the Oscilloscope Control panel and set CHART DRIVE switch to MM/SEC.

80. Set the sensitivities on the Oscilloscope Amplifier as follows:

- CHANNEL 3 to 5 MV/MM
- CHANNEL 4 to 0.3 V/CM
- CHANNEL 5 to 50 MV/MM.

NOTE: Perform step 77 as quickly as possible as measurement time is limited to approximately 3 minutes. If measurement cannot be completed before pulse torquing ends, perform step 76, repeat steps 72 and 74, and then complete measurements not taken.

81. Measure and record the oscilloscope indications of A through E as represented on figure 3.

82. When the Middle Gimbal Indicator on the Gimbal Position Control panel appears to stop, stop the Oscilloscope and record the maximum amplitude (neglect spikes) of CHANNELS 3 and 5 on the data sheets. Using

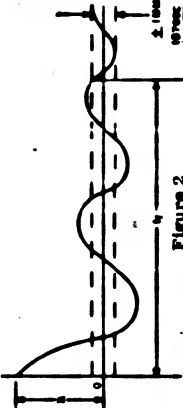
figure 3.

83. Remove the jumper from J2-D of

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SUBSYSTEM	LEM G & N SYSTEM	ASSY										
<p>the equation given in Figure 1, calculate from the Oscillograph chart the maximum amplitude of CHANNEL 4. Record on data sheet. Set all sensitivities on the Oscillograph Amplifiers to OFF.</p> <p>78. Remove all jumper cables placed during this procedure.</p> <p>99. Perform the following DSKY operations:</p> <p>VERB 41 NOUN 20 ENTR</p> <p>VERB 21 NOUN 22 Flashing ENTR</p> <p>+00000</p> <p>VERB 23 NOUN 22 Flashing ENTR</p> <p>+00000</p> <p>VERB 23 NOUN 22 Flashing ENTR</p> <p>+00000</p> <p>VERB 41 NOUN 22 Displayed</p>												
<p>81. Set the following controls on the Oscillograph Signal Selector panel to monitor the associated signals:</p> <table> <tr> <th>CHANNEL POSITION</th><th>Signal</th></tr> <tr> <td>a. 1-2</td><td>IG &amp; Y Gyro Error Signal</td></tr> <tr> <td>b. 2-2</td><td>MG Error Signal</td></tr> <tr> <td>c. 2-2</td><td>OG Error Signal</td></tr> </table> <p>92. Insure that CH2AC pushbutton on the Oscillograph Signal Selector panel is IN.</p> <p>93. Perform the following DSKY operations:</p> <p>VERB 41 NOUN 20 ENTR</p> <p>b. Observe</p> <p>VERB 21 NOUN 22 Flashing ENTR</p> <p>c. +00000</p>					CHANNEL POSITION	Signal	a. 1-2	IG & Y Gyro Error Signal	b. 2-2	MG Error Signal	c. 2-2	OG Error Signal
CHANNEL POSITION	Signal											
a. 1-2	IG & Y Gyro Error Signal											
b. 2-2	MG Error Signal											
c. 2-2	OG Error Signal											
<p>94. Set the PHASE SHFT SELECTOR on the Phase Sensitive Demodulators of CHANNELS 1, 2 and 3 to VARIABLE. Set FILTER switches to HL.</p> <p><u>IG STEP RESPONSE</u></p> <p>95. Apply the 10V step input to the IG TDA test input by connecting a jumper between TB5-27 of TPA #2 and TB3-11 of TPA #2.</p> <p>96. Press the CHART SPEEDS 300 pushbutton on the Oscillograph Control panel and set the following channel sensitivities on the Oscillograph Amplifier panel:</p> <table> <tr> <th>Channel</th><th>Sensitivity</th></tr> <tr> <td>a. 1</td><td>50 MV/MM</td></tr> <tr> <td>b. 2</td><td>10 MV/MM</td></tr> <tr> <td>c. 3</td><td>10 MV/MM</td></tr> </table> <p>97. Set and hold SERVO TEST switch on TPA #2 in the ON position and adjust CAL ADJ control on CHANNEL 1 Oscillograph Amplifier to obtain a step input amplitude A (see figure 2) of 20 mm. Continue holding SERVO TEST switch to ON.</p> <p>98. Start Oscillograph by setting CHART DRIVE switch on Oscillograph Control panel to MM/SEC.</p>					Channel	Sensitivity	a. 1	50 MV/MM	b. 2	10 MV/MM	c. 3	10 MV/MM
Channel	Sensitivity											
a. 1	50 MV/MM											
b. 2	10 MV/MM											
c. 3	10 MV/MM											
<p>4. Observe</p> <p>VERB 23 NOUN 22 Flashing ENTR</p> <p>e. +00000</p> <p>f. Observe</p> <p>VERB 23 NOUN 22 Flashing ENTR</p> <p>g. +00000</p> <p>h. Observe</p> <p>VERB 41 NOUN 22 Displayed ENTR</p> <p>i. VERB 36</p>												
<p>94. Set the PHASE SHFT SELECTOR on the Phase Sensitive Demodulators of CHANNELS 1, 2 and 3 to VARIABLE. Set FILTER switches to HL.</p> <p><u>IG STEP RESPONSE</u></p> <p>95. Apply the 10V step input to the IG TDA test input by connecting a jumper between TB5-27 of TPA #2 and TB3-11 of TPA #2.</p> <p>96. Press the CHART SPEEDS 300 pushbutton on the Oscillograph Control panel and set the following channel sensitivities on the Oscillograph Amplifier panel:</p> <table> <tr> <th>Channel</th><th>Sensitivity</th></tr> <tr> <td>a. 1</td><td>50 MV/MM</td></tr> <tr> <td>b. 2</td><td>10 MV/MM</td></tr> <tr> <td>c. 3</td><td>10 MV/MM</td></tr> </table> <p>97. Set and hold SERVO TEST switch on TPA #2 in the ON position and adjust CAL ADJ control on CHANNEL 1 Oscillograph Amplifier to obtain a step input amplitude A (see figure 2) of 20 mm. Continue holding SERVO TEST switch to ON.</p> <p>98. Start Oscillograph by setting CHART DRIVE switch on Oscillograph Control panel to MM/SEC.</p>					Channel	Sensitivity	a. 1	50 MV/MM	b. 2	10 MV/MM	c. 3	10 MV/MM
Channel	Sensitivity											
a. 1	50 MV/MM											
b. 2	10 MV/MM											
c. 3	10 MV/MM											
<p>94. Set the PHASE SHFT SELECTOR on the Phase Sensitive Demodulators of CHANNELS 1, 2 and 3 to VARIABLE. Set FILTER switches to HL.</p> <p><u>IG STEP RESPONSE</u></p> <p>95. Apply the 10V step input to the IG TDA test input by connecting a jumper between TB5-27 of TPA #2 and TB3-11 of TPA #2.</p> <p>96. Press the CHART SPEEDS 300 pushbutton on the Oscillograph Control panel and set the following channel sensitivities on the Oscillograph Amplifier panel:</p> <table> <tr> <th>Channel</th><th>Sensitivity</th></tr> <tr> <td>a. 1</td><td>50 MV/MM</td></tr> <tr> <td>b. 2</td><td>10 MV/MM</td></tr> <tr> <td>c. 3</td><td>10 MV/MM</td></tr> </table> <p>97. Set and hold SERVO TEST switch on TPA #2 in the ON position and adjust CAL ADJ control on CHANNEL 1 Oscillograph Amplifier to obtain a step input amplitude A (see figure 2) of 20 mm. Continue holding SERVO TEST switch to ON.</p> <p>98. Start Oscillograph by setting CHART DRIVE switch on Oscillograph Control panel to MM/SEC.</p>					Channel	Sensitivity	a. 1	50 MV/MM	b. 2	10 MV/MM	c. 3	10 MV/MM
Channel	Sensitivity											
a. 1	50 MV/MM											
b. 2	10 MV/MM											
c. 3	10 MV/MM											

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SUBSYSTEM	LEM G & N SYSTEM	ASSY										
<p>99. After observing a constant servo error on CHANNEL 1 of Oscillograph, release SERVO TEST switch. Observe Oscillograph trace for an additional constant servo error then set CHART DRIVE switch to OFF.</p> <p>90. Determine and record the number of error signal oscillation peaks outside <math>\pm 1</math> mm of the final value. (See Figure 2.) Record magnitude A. Record the time <math>t_f</math> for the error signal to reach and stay within 1 mm of its final value.</p>												
<div>  <p>Figure 2</p> </div>												
<p>MG STEP RESPONSE</p> <p>91. Perform the following DSKY operations:</p>												
<p>a. VERB 41 NOUN 20 ENTR</p>												
<p>b. Observe</p>												
<p>VERB 21 NOUN 22 Flashing ENTR</p>												
<p>c. +00000</p>												
<p>d. Observe</p>												
<p>VERB 23 NOUN 22 Flashing ENTR</p>												
<p>e. +00000</p>												
<p>f. Observe</p>												
<p>VERB 23 NOUN 22 Flashing ENTR</p>												
<p>g. +00000</p>												
<p>h. Observe</p>												
<p>VERB 41 NOUN 22 Displayed</p>												
<p>i. VERB 26 ENTR</p>												
<p>92. Apply the 5V step input to the MG TDA test input by removing the jumper of step 85 and connecting it between TBS-18 of TPA #2 and TBS-10 of TPA #2.</p>												
<p>93. Set the following Channel sensitivities on the Oscillograph Amplifier panel:</p> <table> <tr> <th>Channel</th><th>Sensitivity</th></tr> <tr> <td>a. 1</td><td>10 MV/MM</td></tr> <tr> <td>b. 2</td><td>20 MV/MM</td></tr> <tr> <td>c. 3</td><td>10 MV/MM</td></tr> </table>	Channel	Sensitivity	a. 1	10 MV/MM	b. 2	20 MV/MM	c. 3	10 MV/MM				
Channel	Sensitivity											
a. 1	10 MV/MM											
b. 2	20 MV/MM											
c. 3	10 MV/MM											
<p>94. Set and hold SERVO TEST switch on TPA #2 in the ON position and adjust CAL ADJ control on CHANNEL 2 Oscillograph Amplifier to obtain a step input amplitude A (see figure 2) of 20 mm. Continue holding SERVO TEST switch to ON.</p>												
<p>95. Start Oscillograph by setting CHART DRIVE switch on Oscillograph Control panel to MM/SEC.</p>												
<p>96. After observing a constant servo error on CHANNEL 2 of Oscillograph, release SERVO TEST switch. Observe Oscillograph trace for an additional constant servo error then set CHART DRIVE switch to OFF.</p>												
<p>97. Determine and record the number of error signal oscillation peaks outside <math>\pm 1</math> mm of the final value. (See Figure 2.) Record magnitude A. Record the time <math>t_f</math> for the error signal to reach and stay within 1 mm of its final value.</p>												

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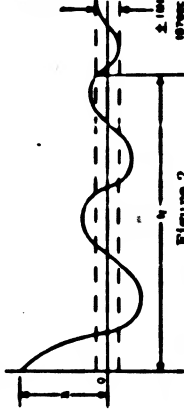


Figure 2

JOB GIMBAL RESPONSE TEST

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SUBSYSTEM LEM G & N SYSTEM

ASSY

QC STEP RESPONSE

98. Perform the following DSKY operations:

a. VERB 41 NOUN 20 ENTR

b. Observe

VERB 21 NOUN 22 Flashing

c. +00000 ENTR

d. Observe

VERB 22 NOUN 22 Flashing

e. +00000 ENTR

f. Observe

VERB 23 NOUN 22 Flashing

g. +00000 ENTR

h. Observe

VERB 41 NOUN 22 Displayed

i. VERB 26 ENTR

99. Apply the 5V step input to the OG TDA test input by removing the jumper of step 92 and connecting it between TB6-18 of TPA #2 and TB2-4 of TPA #2.

100. Set the following channel sensitivities on the Oscillograph Amplifier panel:

Channel	Sensitivity
a. 1	10 MV/MM
b. 2	10 MV/MM
c. 3	20 MV/MM

>101. Set and hold SERVO TEST switch on TPA #2 in the ON position and adjust CAL ADJ control on CHANNEL 3 Oscillograph Amplifier to obtain a step input amplitude A (see figure 2) of 20 mm. Continue holding SERVO TEST switch to ON.

102. Start Oscillograph by setting CHART DRIVE switch on Oscillograph Control panel to MM/SEC.

103. After observing a constant servo error on CHANNEL 3 of Oscillograph, release SERVO TEST switch. Observe Oscillograph trace for an additional

constant servo error then set CHART DRIVE switch to OFF.

104. Determine and record the number of error signal oscillation peaks outside  $\pm 1$  mm of the final value. (See Figure 2.) Record magnitude A. Record the time  $t_f$  for the error signal to reach and stay within 1 mm of its final value.

NORMALIZATION OF SYSTEM

105. Perform the following DSKY operation:

a. VERB 26 ENTR

106. Perform the following DSKY operations:

a. VERB 41 NOUN 20 ENTR

b. Observe

VERB 21 NOUN 22 Flashing

c. +00000 ENTR

d. Observe

VERB 22 NOUN 22 Flashing

e. +00000 ENTR

f. Observe

VERB 23 NOUN 22 Flashing

g. +00000

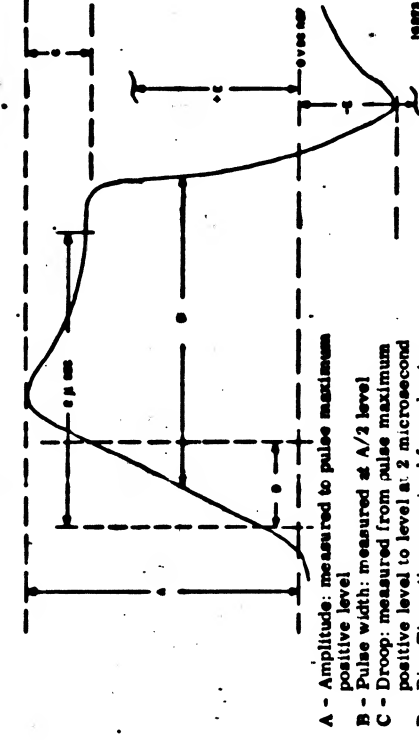


Figure 3. Waveform Description

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APOLLO GSN  
EQUIPMENT TEST  
DATA SHEET 1 OF 6

JDC  
NO. 12619  
REV. M  
INITIAL TORR 27134

JOB GIMBAL RESPONSE TEST

ASSEMBLY UNDER TEST		TEST HISTORY	
TITLE	DATE	START	END
SER. NO.	DWG	REV.	TIME
MAJOR GROUND SUPPORT EQUIPMENT		END	TOTAL ELAPSED
NAME	SER. NO.	CAL DATE	
NAME	SER. NO.	CAL DATE	
CONDUCTED BY		APPROVED BY	
NAME/AFFILIATION		NAME/AFFILIATION	

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ/ACC
3	28 VDC Bus voltage	vdc	27.75		28.25	
9	PHASE GENER- ATOR 3200 CP8 readout	deg				
15	PHASE GENER- ATOR 3200 CP8 readout	deg				
17	PHASE GENER- ATOR 3200 CP8 readout	deg				
19	IG error phase shift	deg				
21	IG error in-phase null	mV	-60		+60	

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APOLLO GSN  
EQUIPMENT TEST  
DATA SHEET 2 OF 6

JDC  
NO. 12619  
REV. M

JOB GIMBAL RESPONSE TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ/ACC
22(15)	PHASE GENER- ATOR 3200 CP8 readout	deg				
22(17)	PHASE GENER- ATOR 3200 CP8 readout	deg				
22(19)	MG error phase shift	deg				
23	MG error in-phase null	mV	-60		+60	
24(15)	PHASE GENER- ATOR 3200 CP8 readout	deg				
24(17)	PHASE GENER- ATOR 3200 CP8 readout	deg				
24(19)	OG error phase shift	deg				
25	OG error in-phase null	mV	-60		+60	
26.a	Total OG TDA	volts			10	
26.b	Total MG TDA	volts			16	
26.c	Total IG TDA	volts			10	

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APOLLO GSN  
EQUIPMENT TEST  
DATA SHEET 3 OF 6

JDC  
NO. 12619  
REV. M

JOB GIMBAL RESPONSE TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ/ACC
34	OG - $\Delta\theta$ abort	Refer to fig 3				
34.a.A	Amplitude	peak volts	4		10	
34.a.B	Pulse width	$\mu$ sec	2		4	
34.a.C	Droop	volts			$\frac{\Delta}{5}$	
34.a.D	Rise Time	$\mu$ sec			0.5	
34.a.E	Noise with respect to 0 vdc reference	volts	-4.0		+4.0	
34.b	IRIG PVR	vdc				
34.c	IRIG Torque Current Monitor	vdc				
34.d	IRIG 5F voltage	vdc				
41	OG + $\Delta\theta$ abort	Refer to fig 3				
41.A	Amplitude	peak volts	4		10	
41.B	Pulse width	$\mu$ sec	2		4	
41.C	Droop	volts			$\frac{\Delta}{5}$	
41.D	Rise Time	$\mu$ sec			0.5	
41.E	Noise with respect to 0 vdc reference	volts	-4.0		+4.0	

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APOLLO GSN  
EQUIPMENT TEST  
DATA SHEET 4 OF 6

JDC  
NO. 12619  
REV. M

JOB GIMBAL RESPONSE TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ/ACC
43	OG CDU Fine Error on CH3	volt rms	-0.070		+0.070	
43	OG TM Current CH4	amps	-0.125		+0.125	
43	OG CDU Coarse Error on CH5	volt rms	-0.680		+0.680	
53	IG - $\Delta\theta$ abort	Refer to fig 3				
53.A	Amplitude	peak volts	4		10	
53.B	Pulse width	$\mu$ sec	2		4	
53.C	Droop	volts			$\frac{\Delta}{5}$	
53.D	Rise Time	$\mu$ sec			0.5	
53.E	Noise with respect to 0 vdc reference	volts	-4.0		+4.0	
59	IG + $\Delta\theta$ abort	Refer to fig 3				
59.A	Amplitude	peak volts	4		10	
59.B	Pulse width	$\mu$ sec	2		4	
59.C	Droop	volts			$\frac{\Delta}{5}$	
59.D	Rise Time	$\mu$ sec			0.5	
59.E	Noise with respect to 0 vdc reference	volts	-4.0		+4.0	

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APOLLO GSN  
EQUIPMENT TEST  
DATA SHEET 5 OF 5

JDC  
NO. 12519  
REV. M

JOB GIMBAL RESPONSE TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REL ACC
60	IG CDU Fine Error on CH1	volt rms	-0.070		+0.070	
60	IG TM Current on CH4	amps	-0.125		+0.125	
60	IG CDU Coarse Error on CH5	volt rms	-0.680		+0.680	
70	MG - A9 abort	Refer to fig 3				
70.A	Amplitude	peak volts	4		10	
70.B	Pulse width	$\mu$ sec	3		4	
70.C	Droop	volts			$\frac{A}{5}$	
70.D	Rise Time	$\mu$ sec			0.5	
70.E	Noise with respect to 0 vdc reference	volts	-4.0		+4.0	
77	MG + A9 abort	Refer to fig 3				
77.A	Amplitude	peak volts	4		10	
77.B	Pulse width	$\mu$ sec	3		4	
77.C	Droop	volts			$\frac{A}{5}$	
77.D	Rise Time	$\mu$ sec			0.5	
77.E	Noise with respect to 0 vdc reference	volts	-4.0		+4.0	

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APOLLO GSN  
EQUIPMENT TEST  
DATA SHEET 5 OF 5

JDC  
NO. 12519  
REV. M

JOB GIMBAL RESPONSE TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REL ACC
76	MG CDU Fine Error on CH2	volt rms	-0.070		+0.070	
76	MG TM Current on CH4	amps	-0.125		+0.125	
76	MG CDU Coarse Error on CH5	volt rms	-0.680		+0.680	
90	Oscillation peaks				3	
	Magnitude A	rms				
	t <sub>r</sub>	rms			100	
97	Oscillation peaks				3	
	Magnitude A	rms				
	t <sub>r</sub>	rms			100	
104	Oscillation peaks				5	
	Magnitude A	rms				
	t <sub>r</sub>	rms			100	
	AGC Displays	All DSKY displays and indications reacted as specified				

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SUBSYSTEM LEM G &amp; N SYSTEM

ASSY

## +MG FRICTION TEST

34. Perform the following DSKY operations:

- VERB 41 NOUN 20 ENTR
- VERB 21 NOUN 22 ENTR
- +00000 ENTR
- VERB 22 NOUN 23 ENTR
- +00000 ENTR
- VERB 23 NOUN 22 ENTR
- +00000 ENTR
- VERB 41 NOUN 22 Displayed
- VERB 24 NOUN 01 ENTR
- 00403 ENTR
- VERB 21 NOUN 01 Flashing
- 40000 ENTR
- VERB 22 NOUN 01 Flashing
- 40077 ENTR

37. Remove jumper from J2-F of the Auxiliary Input panel and place it on J2-E to monitor OG + Δθ short signal on the oscilloscope.

38. Perform the following DSKY operations:

- VERB 42 ENTR
- VERB 33 ENTR

39. Press CHART SPEEDS 1 pushbutton on the Oscillograph Control panel and set CHART DRIVE switch to MM/SEC.

40. Set the sensitivities on the Oscillograph Amplifier as follows:

- CHANNEL 3 to 5 MV/MM
- CHANNEL 4 to 0.2 V/CM
- CHANNEL 5 to 50 MV/MM.

41. Measure and record the oscilloscope indication of A through E as represented in Figure 3.

42. When the Outer Gimbal Indicator on the Gimbal Position Control panel appears to stop, stop the Oscillograph and record the maximum amplitude (neglect spikes) of CHANNELS 3 and 5. Using the equation given in Figure 1, calculate from the Oscillograph chart the maximum amplitude of all sensitivities on the Oscillograph Amplifiers to OFF.

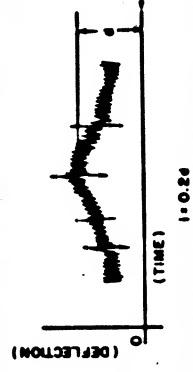


Figure 1

Where 0.2 is the Oscillograph sensitivity in volts per centimeter, and d is the deflection in centimeters measured from zero reference to the midpoint of trace. Ignore any noise spikes.

## -MG FRICTION TEST

43. Perform the following DSKY operations:

- VERB 41 NOUN 20 ENTR
- VERB 21 NOUN 22 Flashing
- +00000 ENTR
- VERB 22 NOUN 22 Flashing

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SUBSYSTEM LEM G &amp; N SYSTEM

ASSY

51. Set the sensitivities on the Oscillograph Amplifier as follows:

- CHANNEL 1 to 5 MV/MM
- CHANNEL 4 to 0.2 V/CM
- CHANNEL 5 to 50 MV/MM

52. Measure and record the oscilloscope indications of A through E as represented on Figure 3.

53. When the Inner Gimbal Indicator on the Gimbal Position Control panel appears to stop, stop the Oscillograph. Set all sensitivities on the Oscillograph to OFF.

## +MG FRICTION TEST

54. Perform the following DSKY operations:

- VERB 41 NOUN 20 ENTR
- VERB 21 NOUN 22 Flashing
- +00000 ENTR
- VERB 22 NOUN 22 Flashing
- +00000 ENTR
- VERB 23 NOUN 22 Flashing
- +00000 ENTR
- VERB 41 NOUN 22 Displayed
- VERB 24 NOUN 01 ENTR
- 00403 ENTR
- VERB 21 NOUN 01 Flashing
- 40000 ENTR
- VERB 22 NOUN 01 Flashing
- 40077 ENTR

55. Remove the jumper from J2-B of the Auxiliary Input panel and place it on J2-A to monitor IG + Δθ short signal on the oscilloscope.

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SUBSYSTEM LEM G &amp; N SYSTEM

ASSY

56. Perform the following DSKY operations:

- VERB 42 ENTR
- VERB 33 ENTR

57. Press CHART SPEEDS 1 pushbutton on the Oscillograph Control panel and set CHART DRIVE switch to MM/SEC.

58. Set the sensitivities on the Oscillograph Amplifier as follows:

- CHANNEL 1 to 5 MV/MM
- CHANNEL 4 to 0.2 V/CM
- CHANNEL 5 to 50 MV/MM.

59. Measure and record the oscilloscope indications of A through E as represented on Figure 3.

60. When the Inner Gimbal Indicator on the Gimbal Position Control panel appears to stop, stop the Oscillograph and record the maximum amplitude (neglect spikes) of CHANNELS 1 and 5. Using the equation given in Figure 1, calculate the maximum amplitude of CHANNEL 4. Record on data sheet. Set all sensitivities on the Oscillograph amplifiers to OFF.

## -MG FRICTION TEST

61. Perform the following DSKY operations:

- VERB 41 NOUN 20 ENTR
- VERB 21 NOUN 22 Flashing
- +00000 ENTR
- VERB 22 NOUN 22 Flashing
- +00000 ENTR
- VERB 23 NOUN 22 Flashing
- +06750 ENTR
- VERB 41 NOUN 22 Displayed
- VERB 24 NOUN 01 ENTR

62. Remove the jumper from J2-D of

SUBSYSTEM LEM G &amp; N SYSTEM

ASSY

NOTE: Perform step 70 as quickly as possible as measurement time is limited to approximately 4 minutes. If measurement cannot be completed before pulse torquing ends, perform step 71, repeat steps 61 and 67, and then complete measurements not taken.

63. Remove the jumper from J2-B of the Auxiliary Input panel and place it on J2-C to monitor MG + Δθ short signal on the Oscilloscope.

74. Perform the following DSKY operations:

- VERB 42 ENTR
- VERB 33 ENTR

75. Press CHART SPEEDS 1 pushbutton on the Oscillograph Control panel and set CHART DRIVE switch to MM/SEC.

76. Set the sensitivities on the Oscillograph Amplifier as follows:

- CHANNEL 2 to 5 MV/MM
- CHANNEL 4 to 0.2 V/CM
- CHANNEL 5 to 50 MV/MM.

NOTE: Perform step 77 as quickly as possible as measurement time is limited to approximately 2 minutes. If measurement cannot be completed before pulse torquing ends, perform step 78, repeat steps 73 and 74, and then complete measurements not taken.

77. Measure and record the oscilloscope indications of A through E as represented in Figure 3.

78. When the Middle Gimbal Indicator on the Gimbal Position Control panel appears to stop, stop the Oscillograph and record the maximum amplitude (neglect spikes) of CHANNELS 3 and 5 on the data sheets. Using

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JOB	GIMBAL RESPONSE TEST	JDC 12619	REV N	PAGE 9	OF 12
SUBSYSTEM	LEM G & N SYSTEM	ASSY			
<p>the equation given in Figure 1, calculate from the Oscillograph chart the maximum amplitude of CHANNEL 4. Record on data sheet. Set all sensitivities on the Oscillograph Amplifiers to OFF.</p> <p>79. Remove all jumper cables placed during this procedure.</p> <p>80. Perform the following DSKY operations:</p>					
	VERB 41	NOUN 20	ENTR		
	VERB 21	NOUN 22	Flashing		
	+00000		ENTR		
	VERB 22	NOUN 22	Flashing		
	+00000		ENTR		
	VERB 23	NOUN 22	Flashing		
	+00000		ENTR		
	VERB 41	NOUN 22	Displayed		
<p>81. Set the following controls on the Oscillograph Signal Selector panel to monitor the associated signals:</p>					
CHANNEL POSITION		Signal			
a.	1-3	IG & Y Gyro Error Signal			
b.	2-3	MG Error Signal			
c.	3-3	OG Error Signal			
<p>82. Insure that CH2AC pushbutton on the Oscillograph Signal Selector panel is lit.</p> <p>83. Perform the following DSKY operations:</p>					
a.	VERB 41	NOUN 20	ENTR		
b.	Observe				
	VERB 21	NOUN 22	Flashing		
c.	+00000		ENTR		
<p>84. Set the PHASE SHIFT SELECTOR on the Phase Sensitive Demodulators of CHANNELS 1, 2 and 3 to VARIABLE. Set FILTER switches to HI.</p> <p>IG STEP RESPONSE</p> <p>85. Apply the 10<sup>V</sup> step input to the IO TDA Test input by connecting a jumper between TB5-27 of TPA #2 and TB3-11 of TPA #2.</p> <p>86. Press the CHART SPEEDS 200 pushbutton on the Oscillograph Control panel and set the following channel sensitivities on the Oscillograph Amplifier panel:</p>					
Channel		Sensitivity			
a.	1	50 MV/MM			
b.	2	10 MV/MM			
c.	3	10 MV/MM			
<p>87. Set and hold SERVO TEST switch on TPA #2 in the ON position and adjust CAL ADJ control on CHANNEL 1 Oscillograph Amplifier to obtain a step input amplitude A (See figure 2) of 20 mm. Continue holding SERVO TEST switch to ON.</p> <p>88. Start Oscillograph by setting CHART DRIVE switch on Oscillograph Control panel to MM/SEC.</p>					
d.	Observe	VERB 22	NOUN 22	Flashing	
e.	+00000			ENTR	
f.	Observe	VERB 23	NOUN 22	Flashing	
g.	+00000			ENTR	
h.	Observe	VERB 41	NOUN 22	Displayed	
i.	VERB 36			ENTR	

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JOB GIMBAL RESPONSE TEST

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SUBSYSTEM LEM G & N SYSTEM

ASSY

89. After observing a constant servo error on CHANNEL 1 of Oscillograph, release SERVO TEST switch. Observe Oscillograph trace for an additional constant servo error then set CHART DRIVE switch to OFF.

90. Determine and record the number of error signal oscillation peaks outside  $\pm 1$  mm of the final value. (See Figure 2.) Record magnitude A. Record the time  $t_f$  for the error signal to reach and stay within 1 mm of its final value.

Figure 2

MG STEP RESPONSE

91. Perform the following DSKY operations:

times:

a. VERB 41	NOUN 20	ENTR
b. Observe		
VERB 21	NOUN 22	Flashing
c. +00000		ENTR
d. Observe		
VERB 22	NOUN 22	Flashing
e. +00000		ENTR
f. Observe		
VERB 23	NOUN 22	Flashing
g. +00000		ENTR
h. Observe		
VERB 41	NOUN 22	Displayed
i. VERB 36		ENTR

92. Apply the 5V step input to the MG TDA test input by removing the jumper of step 85 and connecting it between TB5-18 of TPA #2 and TB2-10 of TPA #2.

93. Set the following Channel sensitivities on the Oscillograph Amplifier panel:

Channel	Sensitivity
a. 1	10 MV/MM
b. 2	20 MV/MM
c. 3	10 MV/MM

94. Set and hold SERVO TEST switch on TPA #2 in the ON position and adjust CAL ADJ control on CHANNEL 3 Oscillograph Amplifier to obtain a step input amplitude A (see figure 2) of 20 mm. Continue holding SERVO TEST switch to ON.

95. Start Oscillograph by setting CHART DRIVE switch on Oscillograph Control panel to MM/SEC.

96. After observing a constant servo error on CHANNEL 3 of Oscillograph, release SERVO TEST switch. Observe Oscillograph trace for an additional constant servo error then set CHART DRIVE switch to OFF.

97. Determine and record the number of error signal oscillation peaks outside  $\pm 1$  mm of the final value. (See Figure 2.) Record magnitude A. Record the time  $t_f$  for the error signal to reach and stay within 1 mm of its final value.

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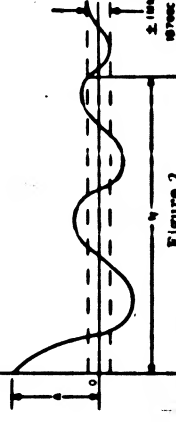


Figure 2

MG STEP RESPONSE

91. Perform the following DSKY operations:

a. VERB 41	NOUN 20	ENTR
b. Observe		
VERB 21	NOUN 22	Flashing
c. +00000		ENTR
d. Observe		
VERB 22	NOUN 22	Flashing
e. +00000		ENTR
f. Observe		
VERB 23	NOUN 22	Flashing
g. +00000		ENTR
h. Observe		
VERB 41	NOUN 22	Displayed
i. VERB 36		ENTR

JOB GIMBAL RESPONSE TEST

JDC 12619 REV N PAGE 11 OF 12

SUBSYSTEM LEM G & N SYSTEM

ASSY

OG STEP RESPONSE

98. Perform the following DSKY operations:

a. VERB 41 NOUN 20 ENTR

b. Observe

VERB 21 NOUN 22 Flashing

c. +00000 ENTR

d. Observe

VERB 22 NOUN 22 Flashing

e. +00000 ENTR

f. Observe

VERB 23 NOUN 22 Flashing

g. +00000 ENTR

h. Observe

VERB 41 NOUN 22 Displayed

i. VERB 36 ENTR

99. Apply the 5V step input to the OG TDA

test input by removing the jumper of step 92

and connecting it between TB5-18 of TPA #2

and TB2-4 of TPA #2.

100. Set the following channel sensitivities on the Oscillograph Amplifier panel:

101. Set and hold SERVO TEST switch on

TPA #2 in the ON position and adjust CAL

ADJ control on CHANNEL 3 Oscillograph

Amplifier to obtain a step input amplitude A

(see figure 2) of 20 mm. Continue holding

SERVO TEST switch to ON.

102. Start Oscillograph by setting CHART

DRIVE switch on Oscillograph Control panel to MM/SEC.

103. After observing a constant servo error on CHANNEL 3 of Oscillograph, release SERVO TEST switch. Observe Oscillograph trace for an additional

constant servo error then set CHART DRIVE switch to OFF.

104. Determine and record the number of error signal oscillation peaks outside  $\pm 1$  mm of the final value. (See Figure 2.) Record magnitude A. Record the time  $t_f$  for the error signal to reach and stay within 1 mm of its final value.

NORMALIZATION OF SYSTEM

105. Perform the following DSKY

operation:

a. VERB 36 ENTR

106. Perform the following DSKY operations:

a. VERB 41 NOUN 20 ENTR

b. Observe

VERB 21 NOUN 22 Flashing

c. +00000 ENTR

d. Observe

VERB 22 NOUN 22 Flashing

e. +00000 ENTR

f. Observe

VERB 23 NOUN 22 Flashing

g. +00000 ENTR

JOB	GIMBAL RESPONSE TEST	JDC 12619	REV N	PAGE 12	OF 12
SUBSYSTEM	LEM G & N SYSTEM	ASSY			
<p>107. Determine and record the number of error signal oscillation peaks outside <math>\pm 1</math> mm of the final value. (See Figure 2.) Record magnitude A. Record the time <math>t_f</math> for the error signal to reach and stay within 1 mm of its final value.</p> <p>108. Perform the following DSKY operation:</p> <p>a. VERB 36 ENTR</p> <p>109. Perform the following DSKY operations:</p> <p>a. VERB 41 NOUN 20 ENTR</p> <p>b. Observe</p> <p>VERB 21 NOUN 22 Flashing</p> <p>c. +00000 ENTR</p> <p>d. Observe</p> <p>VERB 22 NOUN 22 Flashing</p> <p>e. +00000 ENTR</p> <p>f. Observe</p> <p>VERB 23 NOUN 22 Flashing</p> <p>g. +00000 ENTR</p>					

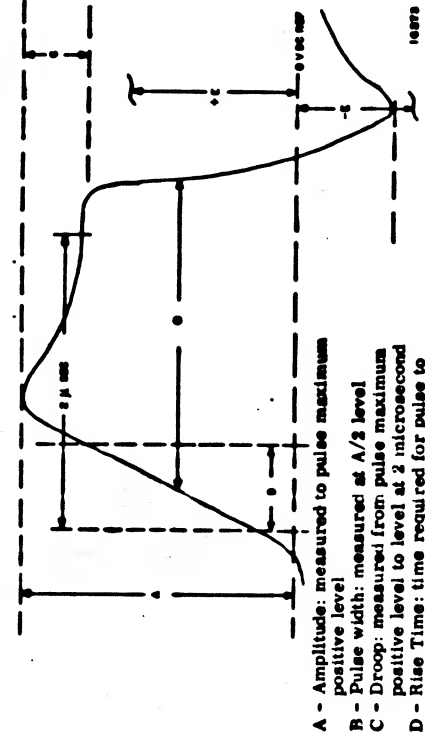


Figure 3. Waveform Description

A - Amplitude: measured to pulse maximum positive level

B - Pulse width: measured at A/2 level

C - Droop: measured from pulse maximum positive level to level at 2 microseconds

D - Rise Time: time required for pulse to rise from 10% to 90% of A.

E - Noise: (No pulse)

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APOLLO GSN  
EQUIPMENT TEST  
DATA SHEET 1 OF 6

JDC  
NO. 12619  
REV. N  
INITIAL TORR 2714

JOB GIMBAL RESPONSE TEST

TITLE		DATE		TEST HISTORY	
SER. NO.	DWG.	REV.	TIME	START	END
NAME			SER. NO.		
NAME			SER. NO.		
CONDUCTED BY			APPROVED BY		
NAME/AFFILIATION			NAME/AFFILIATION		

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ ACC
3	28 VDC Bus voltage	vdc	27.75		28.25	
9	PHASE GENER-ATOR 3200 CPS readout	deg				
15	PHASE GENER-ATOR 3200 CPS readout	deg				
17	PHASE GENER-ATOR 3200 CPS readout	deg				
19	IG error phase shift	deg				
21	IG error in-phase null	mv	-60		+60	

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APOLLO GSN  
EQUIPMENT TEST  
DATA SHEET 2 OF 6

JDC  
NO. 12619  
REV. N

JOB GIMBAL RESPONSE TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ ACC
22(15)	PHASE GENER-ATOR 3200 CPS readout	deg				
22(17)	PHASE GENER-ATOR 3200 CPS readout	deg				
22(19)	MG error phase shift	deg				
23	MG error in-phase null	mv	-60		+60	
24(15)	PHASE GENER-ATOR 3200 CPS readout	deg				
24(17)	PHASE GENER-ATOR 3200 CPS readout	deg				
24(19)	OG error phase shift	deg				
25	OG error in-phase null	mv	-60		+60	
26.a	Total OG TDA	volts			10	
26.b	Total MG TDA	volts			10	
26.c	Total IG TDA	volts			10	

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APOLLO GSN  
EQUIPMENT TEST  
DATA SHEET 3 OF 6

JDC  
NO. 12619  
REV. N

JOB GIMBAL RESPONSE TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ ACC
34	OG - Δθ abort	Refer to fig 3				
34.a.A	Amplitude	peak volts	4		10	
34.a.B	Pulse width	μ sec	2		4	
34.a.C	Droop	volts			Δ 5	
34.a.D	Rise Time	μ sec			0.5	
34.a.E	Noise with respect to 0 vdc reference	volts	-4.0		+4.0	
34.b	IRIG FVR	vdc				
34.c	IRIG Torque Current Monitor	vdc				
34.d	IRIG SF voltage	vdc				
41	OG + Δθ abort	Refer to fig 3				
41.A	Amplitude	peak volts	4		10	
41.B	Pulse width	μ sec	2		4	
41.C	Droop	volts			Δ 5	
41.D	Rise Time	μ sec			0.5	
41.E	Noise with respect to 0 vdc reference	volts	-4.0		+4.0	

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APOLLO GSN  
EQUIPMENT TEST  
DATA SHEET 4 OF 6

JDC  
NO. 12619  
REV. N

JOB GIMBAL RESPONSE TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ ACC
42	OG CDU Fine Error on CH3	volt rms	-0.070		+0.070	
42	OG TM Current CH4	amps	-0.125		+0.125	
42	OG CDU Coarse Error on CH5	volt rms	-0.680		+0.680	
52	IG - Δθ abort	Refer to fig 3				
52.A	Amplitude	peak volts	4		10	
52.B	Pulse width	μ sec	2		4	
52.C	Droop	volts			Δ 5	
52.D	Rise Time	μ sec			0.5	
52.E	Noise with respect to 0 vdc reference	volts	-4.0		+4.0	
59	IG + Δθ abort	Refer to fig 3				
59.A	Amplitude	peak volts	4		10	
59.B	Pulse width	μ sec	2		4	
59.C	Droop	volts			Δ 5	
59.D	Rise Time	μ sec			0.5	
59.E	Noise with respect to 0 vdc reference	volts	-4.0		+4.0	

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APOLLO 68N  
EQUIPMENT TEST  
DATA SHEET 5 OF 6

JDC  
NO. 12610  
REV. Y

JOB GIMBAL RESPONSE TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ/ACC
60	IG CDU Fine Error on CH1	volt rms	-0.070		+0.070	
60	IG TM Current on CH4	amps	-0.125		+0.125	
60	IG CDU Coarse Error on CH5	volt rms	-0.680		+0.680	
70	MG - A9 abort	Refer to fig 3				
70.A	Amplitude	peak volts	4		10	
70.B	Pulse width	$\mu$ sec	2		4	
70.C	Droop	volts			$\frac{A}{5}$	
70.D	Rise Time	$\mu$ sec			0.5	
70.E	Noise with respect to 0 vdc reference	volts	-4.0		+4.0	
77	MG + A9 abort	Refer to fig 3				
77.A	Amplitude	peak volts	4		10	
77.B	Pulse width	$\mu$ sec	2		4	
77.C	Droop	volts			$\frac{A}{5}$	
77.D	Rise Time	$\mu$ sec			0.5	
77.E	Noise with respect to 0 vdc reference	volts	-4.0		+4.0	

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APOLLO 68N  
EQUIPMENT TEST  
DATA SHEET 6 OF 6

JDC  
NO. 12612  
REV. N

JOB GIMBAL RESPONSE TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ/ACC
78	MG CDU Fine Error on CH2	volt rms	-0.070		+0.070	
78	MG TM Current on CH4	amps	-0.125		+0.125	
78	MG CDU Coarse Error on CH5	volt rms	-0.680		+0.680	
90	Oscillation peaks				3	
	Magnitude A	mm				
	t <sub>r</sub>	ms			100	
97	Oscillation peaks				3	
	Magnitude A	mm				
	t <sub>r</sub>	ms			100	
104	Oscillation peaks				5	
	Magnitude A	mm				
	t <sub>r</sub>	ms			100	
	ACC Displays	All DSKY displays and indications reacted as specified				

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SUBSYSTEM	LEM G & N SYSTEM	CTS UPLINK TAPE LOAD PROCEDURES
MANUAL LOAD PROCEDURES	ASSY	

15. Record value of phase shift indicated on PHASE GENERATOR 3200 CPS readout.
16. When signal on Dual Beam Oscilloscope changes phase, adjust PHASE GENERATOR 3200 CPS control on Oscilloscope Signal Selector panel until phase shift of signal on Dual Beam Oscilloscope is zero. (This condition can be obtained at two positions of PHASE GENERATOR 3200 CPS control. Choose the position closest to  $270^\circ$ .)
17. Record value of phase shift indicated on PHASE GENERATOR 3200 CPS readout.
18. Set CHANNEL 1 switch on Oscilloscope Signal Selector panel to 2 to monitor IG error signal on Oscilloscope.
19. Set SENSITIVITY control on Oscilloscope Phase Sensitive Demodulator for Channel 1 to 100 MV/MM and set PHASE SHIFT SELECTOR to VARIABLE.
20. Adjust PHASE ADJUST screw on Channel 1 Phase Sensitive Demodulator to obtain maximum peak-to-peak deflection of Channel 1 pen.
21. Set SENSITIVITY control for Channel 1 to OFF.
22. Set CHANNEL 1 switch on Oscilloscope Signal Selector panel to OFF.
23. Remove input from IG loop by pressing TEST STOP pushbutton on Test Selector panel.
24. Calculate the average of the values obtained in steps 15 and 17. Subtract the value recorded in step 9 from the average and record result.

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SUBSYSTEM	LEM G & N SYSTEM	CTS UPLINK TAPE LOAD PROCEDURES
MANUAL LOAD PROCEDURES	ASSY	

25. Connect IG error signal to PAVM by setting CROSSBAR CONTROL on Primary Signal Selector panel to 135.
26. Set PAVM to phase angle value recorded in step 24.
27. Read and record voltage indicated on PAVM as IG error in-phase null.
28. Connect MG error signal to Dual Beam Oscilloscope by setting CROSSBAR CONTROL on Primary Signal Selector panel to 134.
29. Insure that Signal Generator is set for a square wave of full amplitude and 0.01 cps.
30. Set GIMBAL SERVO TEST switch on Test Selector panel to 2 and press to light GIMBAL SERVO TEST pushbutton.
31. Apply square wave input to MG loop by pressing TEST START pushbutton on Test Selector panel.
32. Adjust PHASE GENERATOR 3200 CPS control on Oscilloscope Signal Selector panel until phase shift of signal on Dual Beam Oscilloscope is zero. (This condition can be obtained at two positions of PHASE GENERATOR 3200 CPS control. Choose the position closest to  $270^\circ$ .)
33. Record value of phase shift indicated on PHASE GENERATOR 3200 CPS readout.
34. When signal on Dual Beam Oscilloscope changes phase, adjust PHASE GENERATOR 3200 CPS control on Oscilloscope Signal Selector panel until phase shift of signal on Dual Beam Oscilloscope is zero. (This condition can be obtained at two positions of PHASE GENERATOR 3200 CPS control. Choose the position closest to  $270^\circ$ .)

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MANUAL LOAD PROCEDURES	ASSY	

35. Record value of phase shift indicated on PHASE GENERATOR 3200 CPS readout.
36. Set CHANNEL 2 switch on Oscilloscope Signal Selector panel to 2 to monitor MG error signal on Oscilloscope.
37. Set SENSITIVITY control on Oscilloscope Phase Sensitive Demodulator for Channel 2 to 100 MV/MM and set PHASE SHIFT SELECTOR to VARIABLE.
38. Adjust PHASE ADJUST screw on Channel 2 Phase Sensitive Demodulator to obtain maximum peak-to-peak deflection of Channel 2 pen.
39. Set SENSITIVITY control for Channel 2 to OFF.
40. Set CHANNEL 2 switch on Oscilloscope Signal Selector panel to OFF.
41. Remove input from MG loop by pressing TEST STOP pushbutton on Test Selector panel.
42. Calculate the average of the values obtained in steps 33 and 35. Subtract the value recorded in step 9 from the average and record result.
43. Connect MG error signal to PAVM by setting CROSSBAR CONTROL on Primary Signal Selector panel to 134.
44. Set PAVM to phase angle value recorded in step 42.

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45. Read and record voltage indicated on PAVM as the MG error in-phase null.
46. Connect OG error signal to Dual Beam Oscilloscope by setting CROSSBAR CONTROL on Primary Signal Selector panel to 133.
47. Insure that Signal Generator is set for a square wave of full amplitude and 0.01 cps.
48. Set GIMBAL SERVO TEST switch on Test Selector panel to 3 and press to light GIMBAL SERVO TEST pushbutton.
49. Apply square wave input to OG loop by pressing TEST START pushbutton on Test Selector panel.
50. Adjust PHASE GENERATOR 3200 CPS control on Oscilloscope Signal Selector panel until phase shift of signal on Dual Beam Oscilloscope is zero. (This condition can be obtained at two positions of PHASE GENERATOR 3200 CPS control. Choose the position closest to  $270^\circ$ .)
51. Record value of phase shift indicated on PHASE GENERATOR 3200 CPS readout.
52. When signal on Dual Beam Oscilloscope changes phase, adjust PHASE GENERATOR 3200 CPS control on Oscilloscope Signal Selector panel until phase shift of signal on Dual Beam Oscilloscope is zero. (This condition can be obtained at two positions of PHASE GENERATOR 3200 CPS control. Choose the position closest to  $270^\circ$ .)
53. Record value of phase shift indicated on PHASE GENERATOR 3200 CPS readout.

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54. Set CHANNEL 3 switch on Oscillograph Signal Selector panel to 2 to monitor OG error signal on Oscillograph.		54. Set CHANNEL 3 switch on Oscillograph Signal Selector panel to 2 to monitor OG error signal on Oscillograph. Press to light CH3 AC pushbutton.
55. Set SENSITIVITY control on Oscillograph Phase Sensitive Demodulator for Channel 3 to 100 MV/MM and set PHASE SHIFT SELECTOR to VARIABLE.		55. Set SENSITIVITY control on Oscillograph Phase Sensitive Demodulator for Channel 3 to 100 MV/MM and set PHASE SHIFT SELECTOR to VARIABLE.
56. Adjust Phase Sensitive Demodulator to obtain maximum peak-to-peak deflection of Channel 3 pen.		56. Adjust Phase Sensitive Demodulator to obtain maximum peak-to-peak deflection of Channel 3 pen.
57. Set SENSITIVITY control for Channel 3 to OFF.		57. Set SENSITIVITY control for Channel 3 to OFF.
58. Set CHANNEL 3 switch on Oscillograph Signal Selector panel to OFF.		58. Set CHANNEL 3 switch on Oscillograph Signal Selector panel to OFF.
59. Remove input from OG loop by pressing TEST STOP pushbutton on Test Selector panel.		59. Remove input from OG loop by pressing TEST STOP pushbutton on Test Selector panel.
60. Calculate the average of the values obtained in steps 51 and 53. Subtract the value recorded in step 9 from the average and record result.		60. Calculate the average of the values obtained in steps 51 and 53. Subtract the value recorded in step 9 from the average and record result.
61. Connect OG error signal to PAVM by setting CROSSBAR CONTROL on Primary Signal Selector panel to 133.		61. Connect OG error signal to PAVM by setting CROSSBAR CONTROL on Primary Signal Selector panel to 133.
62. Set PAVM to phase angle value recorded in step 60.		62. Set PAVM to phase angle value recorded in step 60.
63. Read and record the voltage indicated on PAVM as the OG error in-phase null.		63. Read and record the voltage indicated on PAVM as the OG error in-phase null.

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<u>MANUAL LOAD PROCEDURES</u>		
64. Set CROSSBAR CONTROL on Primary		
Signal Selector panel to monitor following signals on PAVM. Record total value of each:		
a. Voltage	CROSSBAR	
	<u>CONTROL</u>	
a. OG TDA		136
b. MG TDA		137
c. IG TDA		138
<u>-OG FRICTION TEST</u>		
65. Perform following DSKY operations:		
a. VERB 41	NOUN 20	ENTR
b. Observe:		
VERB 21	NOUN 22	Flashing
c. +00000		ENTR
d. Observe:		
VERB 22	NOUN 22	Flashing
e. +00000		ENTR
f. Observe:		
VERB 23	NOUN 22	Flashing
g. +00000		ENTR
h. Observe:		
VERB 41	NOUN 22	Displayed
i. VERB 21	NOUN 01	ENTR
j. 00403		ENTR
k. 37777		ENTR
l. NOUN 15		ENTR
m. 37743		ENTR ENTR
n. 00000		ENTR ENTR
o. 00000		ENTR ENTR
p. 00000		ENTR ENTR
q. 00000		ENTR
<u>-OG FRICTION TEST</u>		
65. Press EXECUTE pushbutton on Programmer and Monitor panel.		
65A. When VERB 21 NOUN 23 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.		
65B. When VERB 22 NOUN 22 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.		
65C. When VERB 23 NOUN 22 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.		
65D. When VERB 41 NOUN 22 are displayed on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.		

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ASSY

MANUAL LOAD PROCEDURES

CTS UNLINK TAPE LOAD PROCEDURES

66. Connect jumpers between following

points:

<u>GSE</u>	<u>From</u>	<u>To</u>
AIP	DIRECT PROBES	CH4DC
	OUTPUT	
AIP	BUFFERED PROBES	CH5AC
	OUTPUT	
AIP	J2-F (OG -Δ Abort)	J1-A (Scope
		B CH1 input)
AIP	J4-F (coax jumper)	SCOPE A
		TRIGGER IN,
		(in AIP)
TPA#2	DIRECT PROBE	TB1-45(hl)
		TB1-49(lo)
TPA#2	BUFFERED PROBE	TB2-35(hl)
		TB2-18(lo)
TPA#2	PULSE PROBE	TB1-6(Blu)
		TB1-9(Blk)

67. Set CHANNEL 3 switch on Oscillograph Signal Selector panel to 5 and CHANNEL 4 and 5 switches to 15 to monitor following signals:

- a. OG CDU fine error on Channel 3
- b. OG TM current on Channel 4
- c. OG CDU coarse error on Channel 5.

68. Insure that CH3AC, CH4DC, and CH5AC pushbuttons on Oscillograph Signal Selector panel are lighted. Insure that PHASE SHIFT SELECTOR switches on Oscillograph Phase Sensitive Demodulators for CHANNELS 1, 2, 3, and 5 are set 800~ 0 DEG and FILTER switches are set to 1.0.

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SUBSYSTEM	LEM GEN SYSTEM	ASSY
<u>MANUAL LOAD PROCEDURES</u>	<u>CTS UPLINK TAPE LOAD PROCEDURES</u>	
	NOTE: Gimbal torquing will start approximately 90 seconds after performance of step 69.	
69. Perform following DSKY operations:	69. Press EXECUTE pushbutton on Programmer and Monitor panel.	
a. VERB 42	ENTR	
b. VERB 33	ENTR	
70. Press CHART SPEEDS 1 pushbutton on Oscillograph Control panel and set CHART DRIVE switch to MM/SEC.		
71. Set sensitivities on Oscillograph Amplifiers as follows:		
a. CHANNEL 3 to 5 MV/MM		
b. CHANNEL 4 to 0.2 V/CM		
c. CHANNEL 5 to 50 MV/MM.		
NOTE: If measurements in step 72 cannot be completed before pulse torquing ends, perform step 73, repeat steps 65 and 69, and then complete measurements not taken.	NOTE: If measurements in step 72 cannot be completed before pulse torquing ends, perform steps 73 and 73A, complete measurements not taken and then proceed to step 73B. If measurements in step 72 are completed before pulse torquing ends, perform steps 73 and 73A and then proceed to step 73B.	
72. Measure and record following signals:		
a. Scope indications A through E as represented on Figure 1.		

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SUBSYSTEM	LEM G&N SYSTEM	ASSY
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# MANUAL LOAD PROCEDURES

## CTS UPLINK TAPE LOAD PROCEDURES

NOTE: Insure that cable

W65 plug P1 is connected to Jack J4 on Current Source Monitor panel and that cable W65 plug P2 is connected to Jack J15 on TPA#1.

b. IRIG PVR (PIPA & IRIG SF MONITOR switch on TPA#1 to position 10) on Current Source Monitor panel per JDC 18216.

c. IRIG Torque Current Monitor (PIPA & IRIG SF MONITOR switch on TPA#1 to position 11) on Current Source Monitor panel per JDC 18216.

d. IRIG Scale Factor (PIPA & IRIG SF MONITOR switch on TPA#1 to position 12) on Current Source Monitor panel per JDC 18216.

73. When Outer Gimbal Indicator on Gimbal Position Control panel appears to stop, set CHART DRIVE switch on Oscillograph Control panel to OFF. Set all sensitivities on Oscillograph Amplifiers to OFF.

73A. Perform following operations:

a. Press EXECUTE pushbutton on Programmer and Monitor panel.

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SUBSYSTEM	LEM G&N SYSTEM	ASSY
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# MANUAL LOAD PROCEDURES

## CTS UPLINK TAPE LOAD PROCEDURES

b. When VERB 21 NOUN 22 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

c. When VERB 22 NOUN 22 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

d. When VERB 23 NOUN 22 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

e. When VERB 41 NOUN 22 are displayed on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

f. When VERB 21 NOUN 01 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

NOTE: Gimbal torquing will start approximately 90 seconds after performance of step 73A-g.

g. When VERB 22 NOUN 01 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

73B. Insure that Outer Gimbal Indicator on Gimbal Position Control panel has stopped before proceeding.

## +OG FRICTION TEST

74. Perform following DSKY operations:

a. VERB 41 NOUN 20 ENTR

b. Observe: VERB 21 NOUN 22 Flashing

c. +00000 ENTR

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SUBSYSTEM	LEM G&N SYSTEM	ASSY
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# MANUAL LOAD PROCEDURES

## CTS UPLINK TAPE LOAD PROCEDURES

d. Observe: VERB 22 NOUN 22 Flashing

e. +00000 ENTR

f. Observe: VERB 23 NOUN 22 Flashing

g. +00000 ENTR

h. Observe: VERB 41 NOUN 22 are displayed on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

i. VERB 24 NOUN 01 ENTR

j. 00403 ENTR

k. Observe: VERB 21 NOUN 01 Flashing

l. 40000 ENTR

m. Observe: VERB 22 NOUN 01 Flashing

n. 40077 ENTR

75. Remove jumper from J2-F on Auxiliary Input panel and connect it to J2-E to monitor OG +A9 abort signal on Dual Beam Oscilloscope.

NOTE: Gimbal torquing will start approximately 90 seconds after performance of step 76.

76. Perform following DSKY operations:

a. VERB 42 ENTR

b. VERB 33 ENTR

77. Press CHART SPEEDS 1 pushbutton on Oscillograph Control panel and set CHART DRIVE switch to MM/SEC.

78. Set sensitivities on Oscillograph Amplifiers as follows:

a. CHANNEL 3 to 5 MV/MM

b. CHANNEL 4 to 0.2 V/CM

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# MANUAL LOAD PROCEDURES

## CTS UPLINK TAPE LOAD PROCEDURES

g. CHANNEL 5 to 50 MV/MM.

79. Measure and record Oscilloscope indications A through E as represented on Figure 1.

80. When Outer Gimbal Indicator on Gimbal Position Control panel appears to stop, set CHART DRIVE switch on Oscillograph Control panel to OFF and record maximum amplitude (neglect spikes) of Channels 3 and 5. Using equation given in Figure 2, calculate from Oscillograph chart the maximum amplitude of Channel 4. Record on data sheet. Set all sensitivities on Oscillograph Amplifiers to OFF.

## -IG FRICTION TEST

81. Perform following DSKY operations:

a. VERB 41 NOUN 20 ENTR

b. Observe: VERB 21 NOUN 22 Flashing

c. +00000 ENTR

d. Observe: VERB 22 NOUN 22 Flashing

e. +00000 ENTR

f. Observe: VERB 23 NOUN 22 Flashing

g. +00000 ENTR

h. Observe: VERB 41 NOUN 22 Displayed

i. VERB 24 NOUN 01 ENTR

j. 00405 ENTR

k. Observe: VERB 21 NOUN 01 Flashing

l. 37777 ENTR

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JOB	GIMBAL RESPONSE TEST		JDC 12619 REV P	PAGE 17 OF 32
SUBSYSTEM	LEM G&N SYSTEM	ASSY		
MANUAL LOAD PROCEDURES		CTS UPLINK TAPE LOAD PROCEDURES		
m. Observe:	VERB 22	NOUN 01	Flashing	DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.
n. 37743			ENTR	
82. Remove jumper from J2-E on Auxiliary Input panel and connect it to J2-B to monitor IG -A9 abort signal on Oscilloscope.				
83. Remove jumper from TB1-45 and connect it to TB2-31 on TPA#2.				
84. Remove jumper from TB2-35 and connect it to TB2-47 on TPA#2.				
85. Set CHANNEL 1 switch on Oscilloscope Signal Selector panel to 5 and CHANNEL 4 and 5 switches to 15 to monitor following signals:				
a. IG CDU fine error on Channel 1				
b. IG TM current on Channel 4				
c. IG CDU coarse error on Channel 5.				
86. Insure that CH4DC and CH5AC push-buttons on Oscilloscope Signal Selector panel are lighted.				
87. Perform following DSKY operations:				
a. VERB 42			ENTR	87. Press EXECUTE pushbutton on Programmer and Monitor panel.
b. VERB 33			ENTR	
88. Press CHART SPEEDS 1 pushbutton on Oscilloscope Control panel and set CHART DRIVE switch to MM/SEC.				
89. Set sensitivities on Oscilloscope Amplifiers as follows:				
a. CHANNEL 1 to 5 MV/MM				
b. CHANNEL 4 to 0.2 V/CM				
c. CHANNEL 5 to 50 MV/MM.				
90. Measure and record Oscilloscope indications A through E as represented on Figure 1.				

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JOB		GIMBAL RESPONSE TEST		JDC 12619 REV P	PAGE 18 OF 32
SUBSYSTEM		LEM G&N SYSTEM		ASSY	
MANUAL LOAD PROCEDURES				CTS UPLINK TAPE LOAD PROCEDURES	
91. When Inner Gimbal Indicator on Gimbal Position Control panel appears to stop, set CHART DRIVE switch on Oscillograph Control panel to OFF. Set all sensitivities on Oscillograph Amplifiers to OFF.					
<u>+IG FRICTION TEST</u>				<u>+IG FRICTION TEST</u>	
92. Perform following DSKY operations:				92. Press EXECUTE pushbutton on Programmer and Monitor panel.	
a.	VERB 41	NOUN 20	ENTR	92A.	When VERB 21 NOUN 22 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.
b.	Observe:	VERB 21	NOUN 22	Flashing	
c.	+00000		ENTR	92B.	When VERB 22 NOUN 22 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.
d.	Observe:	VERB 22	NOUN 22	Flashing	
e.	+00000		ENTR	92C.	When VERB 23 NOUN 22 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.
f.	Observe:	VERB 23	NOUN 22	Flashing	
g.	+00000		ENTR	92D.	When VERB 41 NOUN 22 are displayed on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.
h.	Observe:	VERB 41	NOUN 22	Displayed	
i.	VERB 24	NOUN 01	ENTR	92E.	When VERB 21 NOUN 01 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.
j.	00405		ENTR		
k.	Observe:	VERB 21	NOUN 01	Flashing	
l.	40000		ENTR	92F.	When VERB 22 NOUN 01 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.
m.	Observe:	VERB 22	NOUN 01	Flashing	
n.	40077		ENTR		
93. Remove jumper from J2-B on Auxiliary Input panel and connect it to J2-A to monitor IG +A9 abort signal on Oscilloscope.					

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JOB	GIMBAL RESPONSE TEST		JDC 12619 REV P	PAGE 19 OF 32
SUBSYSTEM	LEM G&N SYSTEM	ASSY		
MANUAL LOAD PROCEDURES		CTS UPLINK TAPE LOAD PROCEDURES		
NOTE: Gimbal torquing will start approximately 90 seconds after performance of step 94.				
94. Perform following DSKY operations:		94. Press EXECUTE pushbutton on Programmer and Monitor panel.		
a. VERB 42	ENTR			
b. VERB 33	ENTR			
95. Press CHART SPEEDS 1 pushbutton on Oscilloscope Control panel and set CHART DRIVE switch to MM/SEC.				
96. Set sensitivities on Oscilloscope Amplifiers as follows:				
a. CHANNEL 1 to 5 MV/MM				
b. CHANNEL 4 to 0.2 V/CM				
c. CHANNEL 5 to 50 MV/MM.				
97. Measure and record Oscilloscope indications A through E as represented on Figure 1.				
98. When Inner Gimbal Indicator on Gimbal Position Control panel appears to stop, set CHART DRIVE switch on Oscilloscope Control panel to OFF. Record maximum amplitude (neglect spikes) of Channels 1 and 5. Using equation given in Figure 2, calculate the maximum amplitude of Channel 4. Record on data sheet. Set all sensitivities on Oscilloscope Amplifiers to OFF.				
-MG FRICTION TEST		-MG FRICTION TEST		
99. Perform following DSKY operations:		99. Press EXECUTE pushbutton on Programmer and Monitor panel.		
a. VERB 41	NOUN 20	ENTR	99A. When VERB 21 NOUN 22 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.	
b. Observe:	VERB 21	NOUN 22	Flashing	
			ENTR	

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JOB	GIMBAL RESPONSE TEST		JDC 12619 REV P	PAGE 20 OF 32
SUBSYSTEM	LEM G&N SYSTEM	ASSY		
MANUAL LOAD PROCEDURES		CTS UPLINK TAPE LOAD PROCEDURES		
d. Observe:	VERB 22	NOUN 22	Flashing	99B. When VERB 22 NOUN 22 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.
e. +00000			ENTR	
f. Observe:	VERB 23	NOUN 22	Flashing	99C. When VERB 23 NOUN 22 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.
g. +06750			ENTR	
h. Observe:	VERB 41	NOUN 22	Displayed	99D. When VERB 41 NOUN 22 are displayed on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.
i. VERB 24		NOUN 01	ENTR	99E. When VERB 21 NOUN 01 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.
j. 00407			ENTR	
k. Observe:	VERB 21	NOUN 01	Flashing	99F. When VERB 22 NOUN 01 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.
l. 14000			ENTR	
m. Observe:	VERB 22	NOUN 01	Flashing	99F. When VERB 22 NOUN 01 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.
n. 00000			ENTR	
100. Remove jumper from J2-A of Auxiliary Input panel and connect it to J2-D to monitor MG -A9 abort signal on Oscilloscope.				
101. Remove jumper from TB2-31 and connect it to TB2-32 on TPA#2.				
102. Remove jumper from TB2-47 and connect it to TB2-41 on TPA#2.				
103. Set CHANNEL 2 switch on Oscilloscope Signal Selector panel to 5 and CHANNEL 4 and 5 switches to 15 to monitor following signals:				
a. MG CDU fine error on Channel 2				
b. MG TM current on Channel 4				
c. MG CDU coarse error on Channel 5.				
104. Insure that CH4DC and CH5AC push-buttons on Oscilloscope Signal Selector panel are lighted.				

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MANUAL LOAD PROCEDURES

NOTE: Gimbal torquing will start approximately 90 seconds after performance of step 105.

105. Perform following DSKY operations:  
a. VERB 42 ENTR  
b. VERB 33 ENTR

106. Press CHART SPEEDS 1 pushbutton on Oscillograph Control panel and set CHART DRIVE switch to MM/SEC.

107. Set sensitivities on Oscillograph Amplifiers as follows:

- a. CHANNEL 2 to 5 MV/MM  
b. CHANNEL 4 to 0.2 V/CM  
c. CHANNEL 5 to 50 MV/MM.

NOTE: Perform step 108 as quickly as possible as measurement time is limited to approximately 4 minutes. If measurements cannot be completed before pulse torquing ends, perform step 109, repeat steps 99 and 105, and then complete measurements not taken.

108. Measure and record Oscilloscope Indications A through E as represented in Figure 1.

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MANUAL LOAD PROCEDURES

109. When Middle Gimbal Indicator on Gimbal Position Control panel appears to stop, set CHART DRIVE switch on Oscillograph Control panel to OFF. Set all sensitivities on Oscillograph Amplifiers to OFF.

- 109A. Perform following operations:  
a. Press EXECUTE pushbutton on Programmer and Monitor panel.  
b. When VERB 21 NOUN 22 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.  
c. When VERB 22 NOUN 22 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.  
d. When VERB 23 NOUN 22 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.  
e. When VERB 41 NOUN 22 are displayed on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.  
f. When VERB 21 NOUN 01 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

NOTE: Gimbal torquing will start approximately 90 seconds after performance of step 109A.

g. When VERB 22 NOUN 01 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

109B. Insure that Outer Gimbal Indicator on Gimbal Position Control panel has stopped before proceeding.

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MANUAL LOAD PROCEDURES

+MG FRICTION TEST

110. Perform following DSKY operations:

- a. VERB 41 NOUN 20 ENTR  
b. Observe: VERB 21 NOUN 22 Flashing ENTR  
c. +00000  
d. Observe: VERB 22 NOUN 22 Flashing ENTR  
e. +00000  
f. Observe: VERB 23 NOUN 22 Flashing ENTR  
g. -00750  
h. Observe: VERB 41 NOUN 22 Displayed ENTR  
i. VERB 24 NOUN 01 ENTR  
j. -00407 ENTR  
k. Observe: VERB 21 NOUN 01 Flashing ENTR  
l. 63777 ENTR  
m. Observe: VERB 22 NOUN 01 Flashing ENTR  
n. 40000

111. Remove jumper from J2-D of Auxiliary Input panel and connect it to J2-C to monitor MG +Δ abort signal on Oscilloscope.

NOTE: Gimbal torquing will start approximately 90 seconds after performance of step 112.

112. Perform following DSKY operations:  
a. VERB 42 ENTR  
b. VERB 33 ENTR

112. Press EXECUTE pushbutton on Programmer and Monitor panel.

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MANUAL LOAD PROCEDURES

+MG FRICTION TEST

113. Press CHART SPEEDS 1 pushbutton on Oscillograph Control panel and set CHART DRIVE switch to MM/SEC.

114. Set sensitivities on Oscillograph Amplifiers as follows:

- a. CHANNEL 2 to 5 MV/MM  
b. CHANNEL 4 to 0.2 V/CM  
c. CHANNEL 5 to 50 MV/MM.

NOTE: Perform step 115 as quickly as possible as measurement time is limited to approximately 2 minutes. If measurements cannot be completed before pulse torquing ends, perform step 116, repeat steps 110 and 112, and then complete measurements not taken.

115. Measure and record Oscilloscope Indications A through E as represented in Figure 1.

116. When Middle Gimbal Indicator on Gimbal Position Control panel appears to stop, set CHART DRIVE switch on Oscillograph Control panel to OFF. Record maximum amplitude (neglect spikes) of Channels

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CTS UPLINK TAPE LOAD PROCEDURES

- 2 and 5 on data sheet. Using equation given in Figure 2, calculate from Oscillograph chart the maximum amplitude of Channel 4. Record on data sheet. Set all sensitivities on Oscillograph Amplifiers to OFF.

116A. Perform following operations:

- a. Press EXECUTE pushbutton on Programmer and Monitor panel.
- b. When VERB 21 NOUN 22 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.
- c. When VERB 22 NOUN 22 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.
- d. When VERB 23 NOUN 22 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.
- e. When VERB 41 NOUN 22 are displayed on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

f. When VERB 21 NOUN 01 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

NOTE: Gimbal torquing will start approximately 90 seconds after performance of step 116A. g.

- g. When VERB 22 NOUN 01 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

116B. Insure that Outer Gimbal Indicator on Gimbal Position Control panel has stopped before proceeding.

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CTS UPLINK TAPE LOAD PROCEDURES

117. Remove all jumper cables connected during this procedure.

118. Perform following DSKY operations:

- a. VERB 41 NOUN 20 ENTR
- b. Observe: VERB 21 NOUN 22 Flashing ENTR
- c. +00000
- d. Observe: VERB 22 NOUN 22 Flashing ENTR
- e. +00000
- f. Observe: VERB 23 NOUN 22 Flashing ENTR
- g. +00000
- h. Observe: VERB 41 NOUN 22 Displayed

119. Set following controls on Oscillograph Signal Selector panel to monitor the associated signals:

CHANNEL Switch Position	Signal
a. 1-2	IG&Y Gyro Error Signal
b. 2-2	MG Error Signal
c. 3-2	OG Error Signal

120. Insure that CH3AC pushbutton on Oscillograph Signal Selector panel is lighted.

121. Enter VERB 36 into DSKY and press ENTR pushbutton.

122. Set PHASE SHIFT SELECTOR on Phase Sensitive Demodulators of Channels 1, 2, and 3 to VARIABLE. Set FILTER switches to HI.

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CTS UPLINK TAPE LOAD PROCEDURES

IG STEP RESPONSE

123. Apply the 10V step input to the IG TDA test input by connecting a jumper between TB5-27 and TB2-11 of TPA#2.

124. Press CHART SPEEDS 200 pushbutton on Oscillograph Control panel and set sensitivities on Oscillograph Amplifiers as follows:

- a. CHANNEL 1 to 20 MV/MM
- b. CHANNEL 2 to 10 MV/MM
- c. CHANNEL 3 to 10 MV/MM

125. Set and hold SERVO TEST switch on TPA#2 to ON and adjust CAL ADJ control on Channel 1 Oscillograph Amplifier to obtain a step input amplitude A (see figure 3) of 20mm. Continue holding SERVO TEST switch to ON.

126. Start Oscillograph by setting CHART DRIVE switch on Oscillograph Control panel to MM/SEC.

127. After observing a constant servo error on Channel 1 of Oscillograph, release SERVO TEST switch. Observe Oscillograph trace for an additional constant servo error then set CHART DRIVE switch to OFF.

128. Determine and record the number of error signal oscillation peaks outside  $\pm 1mm$  of the final value. (See figure 3.) Record magnitude A. Record the time ( $t_p$ ) for the error signal to reach and stay within 1mm of its final value.

MG STEP RESPONSE

129. Perform following DSKY operations:

- a. VERB 41 NOUN 20 ENTR

Programmer and Monitor panel.

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SUBSYSTEM LEM G&N SYSTEM ASSY

CTS UPLINK TAPE LOAD PROCEDURES

IG STEP RESPONSE

- 129A. When VERB 21 NOUN 22 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

- 129B. When VERB 22 NOUN 22 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

- 129C. When VERB 23 NOUN 22 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

- 129D. When VERB 41 NOUN 22 are displayed on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

130. Apply the 5V step input to MG TDA test input by removing jumper connected in step 123 and connecting it between TB5-18 and TB2-10 of TPA#2.

131. Set sensitivities on Oscillograph Amplifiers as follows:

- a. CHANNEL 1 to 10 MV/MM
- b. CHANNEL 2 to 10 MV/MM
- c. CHANNEL 2 to 10 MV/MM

132. Set and hold SERVO TEST switch on TPA#2 to ON and adjust CAL ADJ control on Channel 2 Oscillograph Amplifier to obtain a step input amplitude A (see figure 2) of 20mm. (Rotate PHASE ADJUST control as necessary if unable to obtain a 20mm pen deflection.) Continue holding SERVO TEST switch to ON.

133. Start Oscillograph by setting CHART DRIVE switch on Oscillograph Control panel to MM/SEC.

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JOB	GIMBAL RESPONSE TEST	JDC 12619	REV P	PAGE 29 OF 32
SUBSYSTEM	LEM G&N SYSTEM	ASSY		
MANUAL LOAD PROCEDURES		CTS UPLINK TAPE LOAD PROCEDURES		
134. After observing a constant servo error on Channel 2 of Oscilloscope, release SERVO TEST switch. Observe Oscilloscope trace for an additional constant servo error then set CHART DRIVE switch to OFF.				
135. Determine and record the number of error signal oscillation peaks outside $\pm 1\text{mm}$ of the final value. (See figure 3.) Record magnitude A. Record the time ( $t_p$ ) for the error signal to reach and stay within $1\text{mm}$ of its final value.				
OG STEP RESPONSE		OG STEP RESPONSE		
136. Perform following DSKY operations:		136. Press EXECUTE pushbutton on Programmer and Monitor panel.		
a. VERB 41	NOUN 20	ENTR	136A. When VERB 21 NOUN 22 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.	
b. Observe:	VERB 21	Flashing		
c. +00000	NOUN 22	ENTR	136B. When VERB 22 NOUN 22 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.	
d. Observe:	VERB 22	Flashing	136C. When VERB 23 NOUN 22 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.	
e. +00000	NOUN 22	ENTR	136D. When VERB 41 NOUN 22 are displayed on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.	
f. Observe:	VERB 23	Flashing		
g. +00000	NOUN 22	ENTR	137. Apply the 5V step input to OG TDA test input by removing jumper connected in step 130 and connecting it between TB5-18 and TB2-4 of TPA#2.	
h. Observe:	VERB 41	Displayed	138. Set sensitivities on Oscilloscope Amplifiers as follows:	
i. VERB 36	NOUN 22	ENTR	a. CHANNEL 1 to 10 MV/MM	

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JOB	GIMBAL RESPONSE TEST	JDC 12619	REV P	PAGE 30 OF 32
SUBSYSTEM	LEM G&N SYSTEM	ASSY		
MANUAL LOAD PROCEDURES				
CTS UPLINK TAPE LOAD PROCEDURES				
<p>b. CHANNEL 2 to 10 MV/MM</p> <p>c. CHANNEL 3 to 20 MV/MM.</p> <p>139. Set and hold SERVO TEST switch on TPA#2 to ON and adjust CAL ADJ control on Channel 3 Oscilloscope Amplifier to obtain a step input amplitude A (See figure 3) of 20mm. Continue holding SERVO TEST switch to ON.</p> <p>140. Start Oscilloscope by setting CHART DRIVE switch on Oscilloscope Control panel to MM/SEC.</p> <p>141. After observing a constant servo error on Channel 3 of Oscilloscope, release SERVO TEST switch. Observe Oscilloscope trace for an additional constant servo error then set CHART DRIVE switch to OFF.</p> <p>142. Determine and record the number of error signal oscillation peaks outside <math>\pm 1\text{mm}</math> of the final value. (See Figure 3.) Record magnitude A. Record the time (<math>t_p</math>) for the error signal to reach and stay within <math>1\text{mm}</math> of its final value.</p>				
NORMALIZATION OF SYSTEM				
143. Perform following DSKY operations:				
a. VERB 41	NOUN 20	ENTR	143. Press EXECUTE pushbutton on Programmer and Monitor panel.	
b. Observe:	VERB 21	Flashing	143A. When VERB 21 NOUN 22 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.	
c. +00000	NOUN 22	ENTR	143B. When VERB 22 NOUN 22 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.	
d. Observe:	VERB 22	Flashing	143B. When VERB 22 NOUN 22 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.	
e. +00000	NOUN 22	ENTR		
f. Observe:	VERB 23	Flashing		
g. +00000	NOUN 22	ENTR		

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JOB	GIMBAL RESPONSE TEST	JDC 12619	REV P	PAGE 31 OF 32
SUBSYSTEM	LEM G&N SYSTEM	ASSY		
MANUAL LOAD PROCEDURES				
CTS UPLINK TAPE LOAD PROCEDURES				
<p>143C. When VERB 23 NOUN 22 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.</p> <p>144. Press to extinguish POSITIVE, NEGATIVE, and TAPE READER pushbuttons on XY Interface panel. Set AGC INPUT COUNTERS switch to 1.</p> <p>145. Press to extinguish CH38-10 pushbutton on RDC Interface panel.</p> <p>146. Press to extinguish TAPE FREE RUN pushbutton on Programmer and Monitor panel. Press to light MONITOR pushbutton. AGC INPUT-CTR pushbutton shall go out.</p> <p>147. Set Power switch on Tape Reader to OFF and remove tape.</p> <p>148. Press to extinguish SELF TEST pushbutton on Self Test panel.</p> <p>149. Remove Self Test Assembly from Buffer Box Assembly. Connect cable W226 to Buffer Box Assembly by connecting P2 of W226 to J4 on Buffer Box Assembly, P3 of W226 to J5 on Buffer Box Assembly, and P4 of W226 to J6 on Buffer Box Assembly.</p>				

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JOB	GIMBAL RESPONSE TEST	JDC 12619	REV P	PAGE 32 OF 32
SUBSYSTEM	LEM G&N SYSTEM	ASSY		
MANUAL LOAD PROCEDURES				
CTS UPLINK TAPE LOAD PROCEDURES				
<p>143. Press EXECUTE pushbutton on Programmer and Monitor panel.</p> <p>143A. When VERB 21 NOUN 22 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.</p> <p>143B. When VERB 22 NOUN 22 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.</p>				

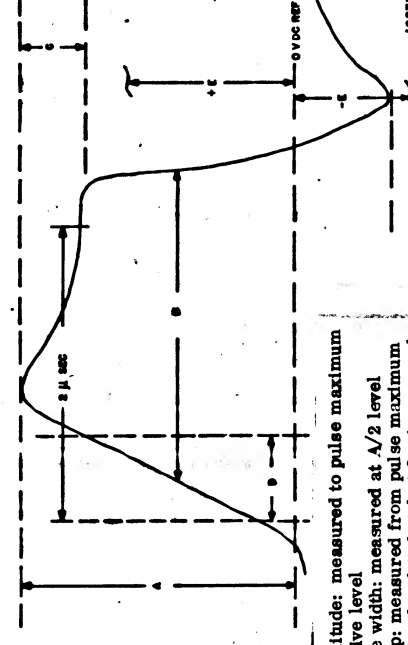


Figure 1. Waveform Description

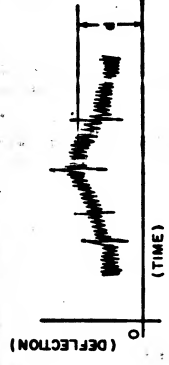
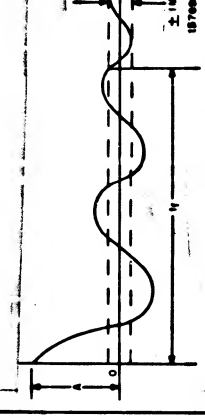


Figure 2



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APOLLO 68N  
EQUIPMENT TEST  
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JDC  
NO. 12619  
REV. P  
INITIAL TDRR 27134

JOB GIMBAL RESPONSE TEST

ASSEMBLY UNDER TEST		TEST HISTORY	
TITLE	DATE	START	END
SER. NO.	DWG	REV.	SITE / LOCATION
MAJOR GROUND SUPPORT EQUIPMENT		TIME	TOTAL ELAPSED
NAME		SER. NO.	CAL DATE
NAME		SER. NO.	CAL DATE
CONDUCTED BY		APPROVED BY	
NAME/AFFILIATION		NAME/AFFILIATION	

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ ACC
3	28 VDC Bus voltage	vdc	27.75		28.25	
9	PHASE GENER-ATOR	deg				
15	3200 CPS readout	deg				
17	PHASE GENER-ATOR	deg				
24	3200 CPS readout	deg				
27	IG error phase shift	mv	-60		+60	
33	PHASE GENER-ATOR	deg				
	3200 CPS readout					

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EQUIPMENT TEST  
DATA SHEET 2 OF 6

JDC  
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JOB GIMBAL RESPONSE TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ ACC
35	PHASE GENER-ATOR	deg				
42	3200 CPS readout	deg				
45	MG error phase shift	mv	-60		+60	
51	PHASE GENER-ATOR	deg				
53	3200 CPS readout	deg				
60	OG error phase shift	deg				
63	OG error in-phase null	mv	-60		+60	
64.a	Total OG TDA	volts			10	
64.b	Total MG TDA	volts			10	
64.c	Total IG TDA	volts			10	
72	OG -Δθ abort	Refer to fig 1				
72.a.A	Amplitude	peak volts	4		10	
72.a.B	Pulse width	usec	2		4	
72.a.C	Droop	volts			$\frac{A}{5}$	
72.a.D	Rise Time	usec			0.5	

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EQUIPMENT TEST  
DATA SHEET 3 OF 6

JDC  
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JOB GIMBAL RESPONSE TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ ACC
72.a.E	Noise with respect to 0 vdc reference	volts	-4.0		+4.0	
72.b	IRIG PVR	vdc				
72.c	IRIG Torque Current Monitor	vdc				
72.d	IRIG SF voltage	vdc				
79	OG +Δθ abort	Refer to fig 1				
79.A	Amplitude	peak volts	4		10	
79.B	Pulse width	usec	2		4	
79.C	Droop	volts			$\frac{A}{5}$	
79.D	Rise Time	usec			0.5	
79.E	Noise with respect to 0 vdc reference	volts	-4.0		+4.0	
80	OG CDU Fine Error on CH3	volt rms	-0.070		+0.070	
80	OG TM Current CH4	amps	-0.125		+0.125	
80	OG CDU Coarse Error on CH5	volt rms	-0.680		+0.680	
90	IG - Δθ abort	Refer to fig 1				
90.A	Amplitude	peak volts	4		10	
90.B	Pulse width	usec	2		4	
90.C	Droop	volts			$\frac{A}{5}$	

DATE  
FORM 00147  
Chg. 8-29-63

APOLLO 68N  
EQUIPMENT TEST  
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JDC  
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JOB GIMBAL RESPONSE TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ ACC
90.D	Rise Time	usec			0.5	
90.E	Noise with respect to 0 vdc reference	volts	-4.0		+4.0	
97	IG + Δθ abort	Refer to fig 1				
97.A	Amplitude	peak volts	4		10	
97.B	Pulse width	usec	2		4	
97.C	Droop	volts			$\frac{A}{5}$	
97.D	Rise Time	usec			0.5	
97.E	Noise with respect to 0 vdc reference	volts	-4.0		+4.0	
98	IG CDU Fine Error on CH1	volt rms	-0.070		+0.070	
98	IG TM Current on CH4	amps	-0.125		+0.125	
98	IG CDU Coarse Error on CH6	volt rms	-0.680		+0.680	
108	MG -Δθ abort	Refer to fig 1				
108.A	Amplitude	peak volts	4		10	
108.B	Pulse width	usec	2		4	
108.C	Droop	volts			$\frac{A}{5}$	
108.D	Rise Time	usec			0.5	

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APOLLO G&N  
EQUIPMENT TEST  
DATA SHEET 5 OF 6

JDC  
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JOB GIMBAL RESPONSE TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ/ACC
108.E	Noise with respect to 0 vdc reference	volts	-4.0		+4.0	
115	MG + Abort	Refer to fig 1				
115.A	Amplitude	peak volts	4		10	
115.B	Pulse width	$\mu$ sec	2		4	
115.C	Droop	volts			$\frac{A}{5}$	
115.D	Rise Time	$\mu$ sec			0.5	
115.E	Noise with respect to 0 vdc reference	volts	-4.0		+4.0	
116	MG CDU Fine Error on CH2	volt rms	-0.070		+0.070	
116	MG TM Current on CH4	amps	-0.125		+0.125	
116	MG CDU Coarse Error on CH5	volt rms	-0.680		+0.680	
128	Oscillation peaks				3	
135	Magnitude A	mm				
	$t_f$	ms			100	
135	Oscillation peaks				3	
	Magnitude A	mm				
	$t_f$	ms			100	

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APOLLO G&N  
EQUIPMENT TEST  
DATA SHEET 6 OF 6

JDC  
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JOB GIMBAL RESPONSE TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ/ACC
142	Oscillation peaks				5	
	Magnitude A	mm				
	$t_f$	ms			100	
	AGC Displays	All DSKY displays and indications reacted as specified				

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SUBSYSTEM LEM G & N SYSTEM  
DESCRIPTION A gimbal friction test is performed by driving the Outer and Inner gimbals through plus and minus 360°, one at a time, and the Middle gimbal through 135°. During the slow periods the fine and coarse CDU errors and gimbal torque motor current are monitored on the Oscilloscope. In addition the plus and minus Δθ short signal (see below)

Rev.	Date	TDRR NO.	PAGES REVISED	APPROVAL	REFERENCES
A	7-5-66	30046	JDC 1-7	W. J. NAS	PS 6015000
B	7-21-66	30273	2	W. J. NAS	
C	8-5-66	30522	2, 4, 6-9	EA 21	IMPORTANT See below
D	8-16-66	30702	1	EA 21	
E	11-10-68	31903	2, 3	EA 21	INTERVAL
F	1-12-67	32665	2	EA 21	
G	1-18-67	32668	2	EA 21	
H	2-2-67	32889	All	EA 21	TOOLS AND See appropriate section of JDC MATERIAL
I	11-30-67	35183	1-4, 6-9	All	
J	1-25-68	35482	2-10	All	
K	3-28-68	35978	4-11	EA 21	
L	4-9-68	36046	2-4, 7-9	EA 21	
M	8-20-68	36844	1	EA 21	
N	11-12-68	37020	All	EA 21	
O	12-3-68	37085	2, 31	EA 21	

DESCRIPTION (cont)  
characteristics are checked during each gimbal slew. After the gimbal friction test the OG, MG, and IG stabilization loop responses are tested by providing a step input to each DC stabilization amplifier.

IMPORTANT: Insure that cable W226 is removed and connector assembly (2003098) is connected to LGC test connector before proceeding.

NOTE: Oscilloscope sensitivities given in this JDC are nominal values to be used as a guide. Operator may change sensitivities as required.

VERIFICATION WITH SIDL REQUIRED BEFORE USE  
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FORM 0071A  
Chg. 1-1-66

CTS UPLINK TAPE LOAD PROCEDURES  
TOOLS AND MATERIAL: JDC 12619 CTS UPLINK Tape, P/N 2901657-001.

NOTE: Prepare the LGC for the UPLINK code by establishing the following conditions on the CTS:

- Connect Self Test Assembly, 2014392, to Buffer Box Assembly, 2014254, by connecting P1 to J4, P2 to J5, P3 to J6, and P4 to J10.
- Connect Buffer Box Assembly to CTS by connecting W236 P1 to J1 on Buffer Box and P2 to J5 on CTS, W237 P1 to J2 on Buffer Box and P2 to J11 on CTS, W238 P1 to J3 on Buffer Box and P2 to J17 on CTS, and W239 P1 to J9 on Buffer Box and P2 to J18 on CTS.
- Set digit switches on Self Test Assembly to 00000.
- Self Test panel - Press to light SELF TEST pushbutton.
- Tape Reader - Set Power switch to ON. Load the CTS UPLINK tape. If alarms occur, press PROCEED and ALARM RESET pushbuttons on Programmer and Monitor panel and RESET pushbutton on DSKY.
- Programmer and Monitor panel - Press to light AGC INPUT - CTR and TAPE FREE RUN pushbuttons.
- RDC Interface panel - Press to light CH33-10 pushbutton.

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CTS UPLINK TAPE LOAD PROCEDURES  
STATIC LOOP PARAMETERS

- XY interface panel - Press to light POSITIVE, NEGATIVE, and TAPE READER pushbuttons. Set AGC INPUT COUNTERS switch to 9.
- Programmer and Monitor panel - Press EXECUTE pushbutton. Verify that tape advances to beginning of first UPLINK code.
- Press EXECUTE pushbutton.

INITIALIZATION

- Perform JDC 12613 to establish a Master Initialization condition.
- Set CROSSBAR CONTROL on Primary Signal Selector panel to 173.
- Measure and record 28 VDC Bus voltage indicated on Digital Voltmeter (DVM).

4. Perform following DSKY operations:

- VERB 41 NOUN 20 ENTR
- Observe: VERB 21 NOUN 22 Flashing ENTR
- Observe: +00000
- Observe: VERB 22 NOUN 22 Flashing ENTR
- Observe: +00000
- Observe: VERB 23 NOUN 22 Flashing ENTR
- Observe: +00000
- Observe: VERB 41 NOUN 22 Displayed ENTR
- VERB 36 ENTR

5. Perform following DSKY operations:

- VERB 21 NOUN 01 ENTR
- 00370 ENTR
- 16002 ENTR

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CTS UPLINK TAPE LOAD PROCEDURES  
STATIC LOOP PARAMETERS

- Connect the 28V 3200 cps feedback signal to Dual Beam Oscilloscope by setting CROSSBAR CONTROL on Primary Signal Selector panel to 123.
- Set REFERENCE switch to 4.
- Adjust PHASE GENERATOR 3200 CPS control on Oscilloscope Signal Selector panel until phase shift of signal on Dual Beam Oscilloscope is zero. (This condition can be obtained at two positions of PHASE GENERATOR 3200 CPS control. Choose the position closest to 0°.)
- Record value of phase shift indicated on PHASE GENERATOR 3200 CPS readout.
- Connect IG error signal to Dual Beam Oscilloscope by setting CROSSBAR CONTROL on Primary Signal Selector panel to 135.
- Set Signal Generator for a square wave of full amplitude and 0.01 cps.
- Set GIMBAL SERVO TEST switch on Test Selector panel to 1 and press to light GIMBAL SERVO TEST pushbutton.
- Apply square wave input to IG loop by pressing TEST START pushbutton on Test Selector panel.
- Adjust PHASE GENERATOR 3200 CPS control on Oscilloscope Signal Selector panel until phase shift of signal on Dual Beam Oscilloscope is zero. (This condition can be obtained at two positions of PHASE GENERATOR 3200 CPS control. Choose the position closest to 270°.)

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JOB	GIMBAL RESPONSE TEST	JDC 12619	REV R	PAGE 5 OF 32
SUBSYSTEM	LEM G & N SYSTEM	ASSY		
MANUAL LOAD PROCEDURES	CTS UPLINK TAPE LOAD PROCEDURES			

15. Record value of phase shift indicated on PHASE GENERATOR 3200 CPS readout.
16. When signal on Dual Beam Oscilloscope changes phase, adjust PHASE GENERATOR 3200 CPS control on Oscillograph Signal Selector panel until phase shift of signal on Dual Beam Oscilloscope is zero. (This condition can be obtained at two positions of PHASE GENERATOR 3200 CPS control. Choose the position closest to  $270^{\circ}$ .)
17. Record value of phase shift indicated on PHASE GENERATOR 3200 CPS readout.
18. Set CHANNEL 1 switch on Oscillograph Signal Selector panel to 2 to monitor IG error signal on Oscillograph.
19. Set SENSITIVITY control on Oscillograph Phase Sensitive Demodulator for Channel 1 to 100 MV/MM and set PHASE SHIFT SELECTOR to VARIABLE.
20. Adjust PHASE ADJUST screw on Channel 1 Phase Sensitive Demodulator to obtain maximum peak-to-peak deflection of Channel 1 pen.
21. Set SENSITIVITY control for Channel 1 to OFF.
22. Set CHANNEL 1 switch on Oscillograph Signal Selector panel to OFF.
23. Remove input from IG loop by pressing TEST STOP pushbutton on Test Selector panel.
24. Calculate the average of the values obtained in steps 15 and 17. Subtract the value recorded in step 9 from the average and record result.

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JOB	GIMBAL RESPONSE TEST	JDC 12619	REV R	PAGE 6 OF 32
SUBSYSTEM	LEM G & N SYSTEM	ASSY		
MANUAL LOAD PROCEDURES	CTS UPLINK TAPE LOAD PROCEDURES			

25. Connect IG error signal to PAVM by setting CROSSBAR CONTROL on Primary Signal Selector panel to 135.
26. Set PAVM to phase angle value recorded in step 24.
27. Read and record voltage indicated on PAVM as IG error in-phase null.
28. Connect MG error signal to Dual Beam Oscilloscope by setting CROSSBAR CONTROL on Primary Signal Selector panel to 134.
29. Insure that Signal Generator is set for a square wave of full amplitude and 0.01 cps.
30. Set GIMBAL SERVO TEST switch on Test Selector panel to 2 and press to light GIMBAL SERVO TEST pushbutton.
31. Apply square wave input to MG loop by pressing TEST START pushbutton on Test Selector panel.
32. Adjust PHASE GENERATOR 3200 CPS control on Oscillograph Signal Selector panel until phase shift of signal on Dual Beam Oscilloscope is zero. (This condition can be obtained at two positions of PHASE GENERATOR 3200 CPS control. Choose the position closest to  $270^{\circ}$ .)
33. Record value of phase shift indicated on PHASE GENERATOR 3200 CPS readout.
34. When signal on Dual Beam Oscilloscope changes phase, adjust PHASE GENERATOR 3200 CPS control on Oscillograph Signal Selector panel until phase shift of signal on Dual Beam Oscilloscope is zero. (This condition can be obtained at two positions of PHASE GENERATOR 3200 CPS control. Choose the position closest to  $270^{\circ}$ .)

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JOB	GIMBAL RESPONSE TEST	JDC 12619	REV R	PAGE 7 OF 32
SUBSYSTEM	LEM G & N SYSTEM	ASSY		
MANUAL LOAD PROCEDURES	CTS UPLINK TAPE LOAD PROCEDURES			

- condition can be obtained at two positions of PHASE GENERATOR 3200 CPS control. Choose the position closest to  $270^{\circ}$ .)
35. Record value of phase shift indicated on PHASE GENERATOR 3200 CPS readout.
  36. Set CHANNEL 2 switch on Oscillograph Signal Selector panel to 2 to monitor MG error signal on Oscillograph.
  37. Set SENSITIVITY control on Oscillograph Phase Sensitive Demodulator for Channel 2 to 100 MV/MM and set PHASE SHIFT SELECTOR to VARIABLE.
  38. Adjust PHASE ADJUST screw on Channel 2 Phase Sensitive Demodulator to obtain maximum peak-to-peak deflection of Channel 2 pen.
  39. Set SENSITIVITY control for Channel 2 to OFF.
  40. Set CHANNEL 2 switch on Oscillograph Signal Selector panel to OFF.
  41. Remove input from MG loop by pressing TEST STOP pushbutton on Test Selector panel.
  42. Calculate the average of the values obtained in steps 33 and 35. Subtract the value recorded in step 9 from the average and record result.
  43. Connect MG error signal to PAVM by setting CROSSBAR CONTROL on Primary Signal Selector panel to 134.
  44. Set PAVM to phase angle value recorded in step 42.

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JOB	GIMBAL RESPONSE TEST	JDC 12619	REV R	PAGE 8 OF 32
SUBSYSTEM	LEM G & N SYSTEM	ASSY		
MANUAL LOAD PROCEDURES	CTS UPLINK TAPE LOAD PROCEDURES			

45. Read and record voltage indicated on PAVM as the MG error in-phase null.
46. Connect OG error signal to Dual Beam Oscilloscope by setting CROSSBAR CONTROL on Primary Signal Selector panel to 133.
47. Insure that Signal Generator is set for a square wave of full amplitude and 0.01 cps.
48. Set GIMBAL SERVO TEST switch on Test Selector panel to 3 and press to light GIMBAL SERVO TEST pushbutton.
49. Apply square wave input to OG loop by pressing TEST START pushbutton on Test Selector panel.
50. Adjust PHASE GENERATOR 3200 CPS control on Oscillograph Signal Selector panel until phase shift of signal on Dual Beam Oscilloscope is zero. (This condition can be obtained at two positions of PHASE GENERATOR 3200 CPS control. Choose the position closest to  $270^{\circ}$ .)
51. Record value of phase shift indicated on PHASE GENERATOR 3200 CPS readout.
52. When signal on Dual Beam Oscilloscope changes phase, adjust PHASE GENERATOR 3200 CPS control on Oscillograph Signal Selector panel until phase shift of signal on Dual Beam Oscilloscope is zero. (This condition can be obtained at two positions of PHASE GENERATOR 3200 CPS control. Choose the position closest to  $270^{\circ}$ .)
53. Record value of phase shift indicated on PHASE GENERATOR 3200 CPS readout.

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SUBSYSTEM LEM G &amp; N SYSTEM ASSY

## MANUAL LOAD PROCEDURES

54. Set CHANNEL 3 switch on Oscillograph Signal Selector panel to 2 to monitor OG error signal on Oscillograph.

CTS UPLINK TAPE LOAD PROCEDURES

54. Set CHANNEL 3 switch on Oscillograph Signal Selector panel to 2 to monitor OG error signal on Oscillograph. Press to light CH3 AC pushbutton.

55. Set SENSITIVITY control on Oscillograph Phase Sensitive Demodulator for Channel 3 to 100 MV/MM and set PHASE SHIFT SELECTOR to VARIABLE.

56. Adjust Phase Sensitive Demodulator to obtain maximum peak-to-peak deflection of Channel 3 pen.

57. Set SENSITIVITY control for Channel 3 to OFF.

58. Set CHANNEL 3 switch on Oscillograph Signal Selector panel to OFF.

59. Remove input from OG loop by pressing TEST STOP pushbutton on Test Selector panel.

60. Calculate the average of the values obtained in steps 51 and 53. Subtract the value recorded in step 9 from the average and record result.

61. Connect OG error signal to PAVM by setting CROSSBAR CONTROL on Primary Signal Selector panel to 133.

62. Set PAVM to phase angle value recorded in step 60.

63. Read and record the voltage indicated on PAVM as the OG error in-phase null.

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64. Set CROSSBAR CONTROL on Primary Signal Selector panel to monitor following signals on PAVM. Record total value of each:

a. Voltage CROSSBAR CONTROL  
a. OG TDA 136  
b. MG TDA 137  
c. IG TDA 138

## -OG FRICTION TEST

65. Perform following DSKY operations:

a. VERB 41 NOUN 20 ENTR

b. Observe:

VERB 21 NOUN 22 Flashing

c. +00000 ENTR

d. Observe:

VERB 22 NOUN 22 Flashing

e. +00000 ENTR

f. Observe:

VERB 23 NOUN 22 Flashing

g. +00000 ENTR

h. Observe:

VERB 41 NOUN 22 Displayed

i. VERB 21 NOUN 01 ENTR

j. 00403 ENTR

k. 37777 ENTR

l. NOUN 15 ENTR

m. 37743 ENTR ENTR

n. 00000 ENTR ENTR

o. 00000 ENTR ENTR

p. 00000 ENTR ENTR

q. 00000 ENTR

## -OG FRICTION TEST

65. Press EXECUTE pushbutton on Programmer and Monitor panel.

65A. When VERB 21 NOUN 22 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

65B. When VERB 22 NOUN 22 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

65C. When VERB 23 NOUN 22 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

65D. When VERB 41 NOUN 22 are displayed on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

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66. Connect jumpers between following points:

From To  
AIP DIRECT PROBES CH4DC  
AIP BUFFERED PROBES CH5AC  
AIP J2-F (OG -A9 Abort) J1-A (Scope B CH1 Input)  
AIP J4-F (coax jumper) SCOPE A  
TPA#2 DIRECT PROBE TB1-45(hl)  
TPA#2 BUFFERED PROBE TB1-49(lo)  
TPA#2 PULSE PROBE TB2-35(hl)  
TB2-18(lo)  
TB1-6(hl)  
TB1-9(hl)

67. Set CHANNEL 3 switch on Oscillograph Signal Selector panel to 5 and CHANNEL 4 and 5 switches to 15 to monitor following signals:

a. OG CDU fine error on Channel 3  
b. OG TM current on Channel 4  
c. OG CDU coarse error on Channel 5.  
68. Insure that CH3AC, CH4DC, and CH5AC pushbuttons on Oscillograph Signal Selector panel are lighted. Insure that PHASE SHIFT SELECTOR switches on Oscillograph Phase Sensitive Demodulators for CHANNELS 1, 2, 3, and 5 are set 800~0 DEG and FILTER switches are set to LO.

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NOTE: Gimbal torquing will start approximately 90 seconds after performance of step 69.

69. Perform following DSKY operations:  
a. VERB 42 ENTR  
b. VERB 33 ENTR

69. Press EXECUTE pushbutton on Programmer and Monitor panel.

70. Press CHART SPEEDS 1 pushbutton on Oscillograph Control panel and set CHART DRIVE switch to MM/SEC.

71. Set sensitivities on Oscillograph Amplifiers as follows:

a. CHANNEL 3 to 5 MV/MM  
b. CHANNEL 4 to 0.2 V/CM  
c. CHANNEL 5 to 50 MV/MM.

NOTE: If measurements

in step 72 cannot be completed before pulse torquing ends, perform step 73, repeat steps 65 and 69, and then complete measurements not taken.

NOTE: If measurements

in step 72 cannot be completed before pulse torquing ends, perform steps 73 and 73A, complete measurements not taken and then proceed to step 73B. If measurements in step 72 are completed before pulse torquing ends, perform steps 73 and 73A and then proceed to step 73B.

72. Measure and record following signals:

a. Scope Indications A through E as represented on Figure 1.

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MANUAL LOAD PROCEDURES	CTS UPLINK TAPE LOAD PROCEDURES	
NOTE: Insure that cable W65 plug P1 is connected to Jack J4 on Current Source Monitor panel and that cable W65 plug P2 is connected to Jack J15 on TPA#1.		
b. IRIG PVR (PIPA & IRIG SF MONITOR switch on TPA#1 to position 10) on Current Source Monitor panel per JDC 18216.		
c. IRIG Torque Current Monitor (PIPA & IRIG SF MONITOR switch on TPA#1 to position 11) on Current Source Monitor panel per JDC 18216.		
d. IRIG Scale Factor (PIPA & IRIG SF MONITOR switch on TPA#1 to position 12) on Current Source Monitor panel per JDC 18216.		
73. When Outer Gimbal Indicator on Gimbal Position Control panel appears to stop, set CHART DRIVE switch on Oscillograph Control panel to OFF. Set all sensitivities on Oscillograph Amplifiers to OFF.		
73A. Perform following operations:		
a. Press EXECUTE pushbutton on Programmer and Monitor panel.		

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MANUAL LOAD PROCEDURES	CTS UPLINK TAPE LOAD PROCEDURES	
	b. When VERB 21 NOUN 22 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.	
	c. When VERB 22 NOUN 22 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.	
	d. When VERB 23 NOUN 22 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.	
	e. When VERB 41 NOUN 22 are displayed on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.	
	f. When VERB 21 NOUN 01 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.	
	NOTE: Gimbal torquing will start approximately 90 seconds after performance of step 73A, g.	
	g. When VERB 22 NOUN 01 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.	
	73B. Insure that Outer Gimbal Indicator on Gimbal Position Control panel has stopped before proceeding.	
	+OG FRICTION TEST	
	74. Perform following DSKY operations:	
a. VERB 41 NOUN 20 ENTR		
b. Observe: VERB 21 NOUN 22 Flashing		
c. +00000 ENTR		
	74. Press EXECUTE pushbutton on Programmer and Monitor panel.	
	74A. When VERB 21 NOUN 22 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.	

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<u>MANUAL LOAD PROCEDURES</u>		<u>CTS UPLINK TAPE LOAD PROCEDURES</u>	
d. Observe:	VERB 22 NOUN 22 Flashing	74B. When VERB 22 NOUN 22 flash on	
e. +00000	ENTR	DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.	
f. Observe:	VERB 23 NOUN 22 Flashing	74C. When VERB 23 NOUN 22 flash on	
g. +00000	ENTR	DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.	
h. Observe:	VERB 41 NOUN 22 Displayed	74D. When VERB 41 NOUN 22 are displayed on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.	
i. VERB 24	NOUN 01 ENTR	74E. When VERB 21 NOUN 01 flash on	
j. 00403	ENTR	DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.	
k. Observe:	VERB 21 NOUN 01 Flashing	74F. When VERB 22 NOUN 01 flash on	
l. 40000	ENTR	DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.	
m. Observe:	VERB 22 NOUN 01 Flashing		
n. 40077	ENTR		
75. Remove jumper from J2-F on Auxiliary Input panel and connect it to J2-E to monitor OG-A#9 abort signal on Dual Beam Oscilloscope.			
NOTE: Gimbal torquing will start approximately 90 seconds after performance of step 76.			
76. Perform following DSKY operations:		76. Press EXECUTE pushbutton on Programmer and Monitor panel.	
a. VERB 42	ENTR		
b. VERB 33	ENTR		
77. Press CHART SPEEDS 1 pushbutton on Oscillograph Control panel and set CHART DRIVE switch to MM/SEC.			
78. Set sensitivities on Oscillograph Amplifiers as follows:			
a. CHANNEL 3 to 5 MV/MM			
b. CHANNEL 4 to 0.2 V/CM			

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MANUAL LOAD PROCEDURES	CTS UPLINK TAPE LOAD PROCEDURES	
e. CHANNEL 5 to 50 MV/MM.		
79. Measure and record Oscilloscope indications A through E as represented on Figure 1.		
80. When Outer Gimbal Indicator on Gimbal Position Control panel appears to stop, set CHART DRIVE switch on Oscillograph Control panel to OFF and record maximum amplitude (neglect spikes) of Channels 3 and 5. Using equation given in Figure 2, calculate from Oscillograph chart the maximum amplitude of Channel 4. Record on data sheet. Set all sensitivities on Oscillograph Amplifiers to OFF.		
-IG FRICTION TEST		
81. Perform following DSKY operations:		
a. VERB 41 NOUN 20 ENTR		
b. Observe: VERB 21 NOUN 22 Flashing		
c. +00000 ENTR		
d. Observe: VERB 22 NOUN 22 Flashing		
e. +00000 ENTR		
f. Observe: VERB 23 NOUN 22 Flashing		
g. +00000 ENTR		
h. Observe: VERB 41 NOUN 22 Displayed		
i. VERB 24 NOUN 01 ENTR		
j. 00405 ENTR		
k. Observe: VERB 21 NOUN 01 Flashing		
l. 37777 ENTR		
81. Press EXECUTE pushbutton on Programmer and Monitor panel.		
81A. When VERB 21 NOUN 22 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.		
81B. When VERB 22 NOUN 22 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.		
81C. When VERB 23 NOUN 22 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.		
81D. When VERB 41 NOUN 22 are displayed on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.		
81E. When VERB 21 NOUN 01 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.		
81F. When VERB 22 NOUN 01 flash on		

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MANUAL LOAD PROCEDURES		
m. Observe:	CTS UPLINK TAPE LOAD PROCEDURES	
VERB 22	NOUN 01	Flashing
n. 37743	ENTR	Programmer and Monitor panel.
82. Remove jumper from J2-E on Auxiliary Input panel and connect it to J2-B to monitor IG -A9 abort signal on Oscilloscope.		
83. Remove jumper from TB1-45 and connect it to TB2-31 on TPA#2.		
84. Remove jumper from TB2-35 and connect it to TB2-47 on TPA#2.		
85. Set CHANNEL 1 switch on Oscilloscope Signal Selector panel to 5 and CHANNEL 4 and 5 switches to 15 to monitor following signals:		
a. IG CDU fine error on Channel 1		
b. IG TM current on Channel 4		
c. IG CDU coarse error on Channel 5.		
86. Insure that CH4DC and CH5AC pushbuttons on Oscilloscope Signal Selector panel are lighted.		
87. Perform following DSKY operations:		
a. VERB 42	ENTR	87. Press EXECUTE pushbutton on Programmer and Monitor panel.
b. VERB 33	ENTR	
88. Press CHART SPEEDS 1 pushbutton on Oscilloscope Control panel and set CHART DRIVE switch to MM/SEC.		
89. Set sensitivities on Oscilloscope Amplifiers as follows:		
a. CHANNEL 1 to 5 MV/MM		
b. CHANNEL 4 to 0.2 V/CM		
c. CHANNEL 5 to 50 MV/MM.		
90. Measure and record Oscilloscope indications A through E as represented on Figure 1.		

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SUBSYSTEM LEM GEN SYSTEM		ASSY
MANUAL LOAD PROCEDURES		
91. When Inner Gimbal Indicator on Gimbal Position Control panel appears to stop, set CHART DRIVE switch on Oscilloscope Control panel to OFF. Set all sensitivities on Oscilloscope Amplifiers to OFF.		
+IG FRICTION TEST		
92. Perform following DSKY operations:		
a. VERB 41	NOUN 20	ENTR
b. Observe:	92A. When VERB 21 NOUN 22 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.	
VERB 21	NOUN 22	Flashing
c. +00000	ENTR	
d. Observe:	92B. When VERB 22 NOUN 22 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.	
VERB 22	NOUN 22	Flashing
e. +00000	ENTR	
f. Observe:	92C. When VERB 23 NOUN 22 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.	
VERB 23	NOUN 22	Flashing
g. +00000	ENTR	
h. Observe:	92D. When VERB 41 NOUN 22 are displayed on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.	
VERB 41	NOUN 22	Displayed
i. VERB 24	NOUN 01	ENTR
j. 00405	ENTR	
k. Observe:	92E. When VERB 21 NOUN 01 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.	
VERB 21	NOUN 01	Flashing
l. 40000	ENTR	
m. Observe:	92F. When VERB 22 NOUN 01 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.	
VERB 22	NOUN 01	Flashing
n. 40077	ENTR	
93. Remove jumper from J2-B on Auxiliary Input panel and connect it to J2-A to monitor IG -A9 abort signal on Oscilloscope.		

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MANUAL LOAD PROCEDURES		
NOTE: Gimbal torquing will start approximately 90 seconds after performance of step 94.		
94. Perform following DSKY operations:		
a. VERB 42	ENTR	94. Press EXECUTE pushbutton on Programmer and Monitor panel.
b. VERB 33	ENTR	
95. Press CHART SPEEDS 1 pushbutton on Oscilloscope Control panel and set CHART DRIVE switch to MM/SEC.		
96. Set sensitivities on Oscilloscope Amplifiers as follows:		
a. CHANNEL 1 to 5 MV/MM		
b. CHANNEL 4 to 0.2 V/CM		
c. CHANNEL 5 to 50 MV/MM.		
97. Measure and record Oscilloscope indications A through E as represented on Figure 1.		
98. When Inner Gimbal Indicator on Gimbal Position Control panel appears to stop, set CHART DRIVE switch on Oscilloscope Control panel to OFF. Record maximum amplitude (neglect spikes) of Channels 1 and 5. Using equation given in Figure 2, calculate the maximum amplitude of Channel 4. Record on data sheet. Set all sensitivities on Oscilloscope Amplifiers to OFF.		
-MG FRICTION TEST		
99. Perform following DSKY operations:		
a. VERB 41	NOUN 20	ENTR
b. Observe:	99A. When VERB 21 NOUN 22 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.	
VERB 21	NOUN 22	Flashing
c. +00000	ENTR	

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MANUAL LOAD PROCEDURES		
d. Observe:	NOUN 22	Flashing
VERB 22	ENTR	
e. +00000	ENTR	
f. Observe:	NOUN 22	Flashing
VERB 23	ENTR	
g. +06750	ENTR	
h. Observe:	NOUN 22	Displayed
VERB 41	NOUN 01	ENTR
i. VERB 24	ENTR	
j. 00407	ENTR	
k. Observe:	NOUN 01	Flashing
VERB 21	ENTR	
l. 14000	ENTR	
m. Observe:	NOUN 01	Flashing
VERB 22	ENTR	
n. 00000	ENTR	
100. Remove jumper from J2-A of Auxiliary Input panel and connect it to J2-D to monitor MG -A9 abort signal on Oscilloscope.		
101. Remove jumper from TB2-31 and connect it to TB2-32 on TPA#2.		
102. Remove jumper from TB2-47 and connect it to TB2-41 on TPA#2.		
103. Set CHANNEL 2 switch on Oscilloscope Signal Selector panel to 5 and CHANNEL 4 and 5 switches to 15 to monitor following signals:		
a. MG CDU fine error on Channel 2		
b. MG TM current on Channel 4		
c. MG CDU coarse error on Channel 5.		
104. Insure that CH4DC and CH5AC pushbuttons on Oscilloscope Signal Selector panel are lighted.		

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MANUAL LOAD PROCEDURES	CTS UPLINK TAPE LOAD PROCEDURES
2 and 5 on data sheet. Using equation given in Figure 2, calculate from Oscillograph chart the maximum amplitude of Channel 4. Record on data sheet. Set all sensitivities on Oscillograph Amplifiers to OFF.	
116A. Perform following operations:	
a. Press EXECUTE pushbutton on Programmer and Monitor panel.	
b. When VERB 21 NOUN 22 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.	
c. When VERB 22 NOUN 22 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.	
d. When VERB 23 NOUN 22 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.	
e. When VERB 41 NOUN 22 are displayed on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.	
f. When VERB 21 NOUN 01 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.	
NOTE: Gimbal torquing will start approximately 90 seconds after performance of step 116A, g.	
g. When VERB 22 NOUN 01 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.	
116B. Insure that Outer Gimbal Indicator on Gimbal Position Control panel has stopped before proceeding.	
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117. Remove all jumper cables connected during this procedure.	
118. Perform following DSKY operations:	
a. VERB 41 NOUN 20 ENTR	118. Press EXECUTE pushbutton on Programmer and Monitor panel.
b. Observe: VERB 21 NOUN 22 Flashing ENTR	118A. When VERB 21 NOUN 22 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.
c. +00000	118B. When VERB 22 NOUN 22 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.
d. Observe: VERB 22 NOUN 22 Flashing ENTR	118C. When VERB 23 NOUN 22 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.
e. +00000	118D. When VERB 23 NOUN 22 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel. Observe VERB 41 NOUN 22 are displayed on DSKY.
f. Observe: VERB 23 NOUN 22 Flashing ENTR	
g. +00000	
h. Observe: VERB 41 NOUN 22 Displayed	
119. Set following controls on Oscillograph Signal Selector panel to monitor the associated signals:	
CHANNEL Switch Position	Signal
a. 1-2	IG&Y Gyro Error Signal
b. 2-2	MG Error Signal
c. 3-2	OG Error Signal
120. Insure that CH3AC pushbutton on Oscillograph Signal Selector panel is lighted.	
121. Enter VERB 36 into DSKY and press ENTR pushbutton.	
121. Press EXECUTE pushbutton on Programmer and Monitor panel.	
122. Set PHASE SHIFT SELECTOR on Phase Sensitive Demodulators of Channels 1, 2, and 3 to VARIABLE. Set FILTER switches to HI.	
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IG STEP RESPONSE	IG STEP RESPONSE
123. Apply the 10V step input to the IG TPA test input by connecting a jumper between TB5-27 and TB2-11 of TPA#2.	
124. Press CHART SPEEDS 200 pushbutton on Oscillograph Control panel and set sensitivities on Oscillograph Amplifiers as follows:	
a. CHANNEL 1 to 20 MV/MM	
b. CHANNEL 2 to 10 MV/MM	
c. CHANNEL 3 to 10 MV/MM	
125. Set and hold SERVO TEST switch on TPA#2 to ON and adjust CAL ADJ control on Channel 1 Oscillograph Amplifier to obtain a step input amplitude A (see figure 3) of 20mm. Continue holding SERVO TEST switch to ON.	
126. Start Oscillograph by setting CHART DRIVE switch on Oscillograph Control panel to MM/SEC.	
127. After observing a constant servo error on Channel 1 of Oscillograph, release SERVO TEST switch. Observe Oscillograph trace for an additional constant servo error then set CHART DRIVE switch to OFF.	
128. Determine and record the number of error signal oscillation peaks outside $\pm 1mm$ of the final value. (See figure 3.) Record magnitude A. Record the time ( $t_d$ ) for the error signal to reach and stay within 1mm of its final value.	
MG STEP RESPONSE	MG STEP RESPONSE
129. Perform following DSKY operations:	
a. VERB 41 NOUN 20 ENTR	129. Press EXECUTE pushbutton on Programmer and Monitor panel.
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b. Observe: VERB 21 NOUN 22 Flashing ENTR	129A. When VERB 21 NOUN 22 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.
c. +00000	129B. When VERB 22 NOUN 22 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.
d. Observe: VERB 22 NOUN 22 Flashing ENTR	129C. When VERB 23 NOUN 22 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.
e. +00000	129D. When VERB 41 NOUN 22 are displayed on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.
f. Observe: VERB 23 NOUN 22 Flashing ENTR	
g. +00000	
h. Observe: VERB 41 NOUN 22 Displayed ENTR	
i. VERB 36	
130. Apply the 5V step input to MG TPA test input by removing jumper connected in step 123 and connecting it between TB5-18 and TB2-10 of TPA#2.	
131. Set sensitivities on Oscillograph Amplifiers as follows:	
a. CHANNEL 1 to 10 MV/MM	
b. CHANNEL 2 to 10 MV/MM	
c. CHANNEL 2 to 10 MV/MM	
132. Set and hold SERVO TEST switch on TPA#2 to ON and adjust CAL ADJ control on Channel 2 Oscillograph Amplifier to obtain a step input amplitude A (see figure 2) of 20mm. (Rotate PHASE ADJUST control as necessary if unable to obtain a 20mm pen deflection.) Continue holding SERVO TEST switch to ON.	
133. Start Oscillograph by setting CHART DRIVE switch on Oscillograph Control panel to MM/SEC.	
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MANUAL LOAD PROCEDURES	

## CTS UPLINK TAPE LOAD PROCEDURES

134. After observing a constant servo error on Channel 2 of Oscillograph, release SERVO TEST switch. Observe Oscillograph trace for an additional constant servo error then set CHART DRIVE switch to OFF.

135. Determine and record the number of error signal oscillation peaks outside  $\pm 1\text{mm}$  of the final value. (See figure 3.) Record magnitude A. Record the time ( $t_p$ ) for the error signal to reach and stay within 1mm of its final value.

## OG STEP RESPONSE

136. Perform following DSKY operations:

- VERB 41 NOUN 20 ENTR
  - Observe:  
VERB 21 NOUN 22 Flashing ENTR
  - Observe:  
VERB 22 NOUN 22 Flashing ENTR
  - Observe:  
VERB 23 NOUN 22 Flashing ENTR
  - Observe:  
VERB 41 NOUN 22 Displayed ENTR
  - VERB 36
137. Apply the 5V step input to OG TDA test input by removing jumper connected in step 130 and connecting it between TB5-18 and TB2-4 of TPA#2.
138. Set sensitivities on Oscillograph Amplifiers as follows:
- CHANNEL 1 to 10 MV/MM

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## CTS UPLINK TAPE LOAD PROCEDURES

143C. When VERB 23 NOUN 22 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

144. Press to extinguish POSITIVE, NEGATIVE, and TAPE READER pushbuttons on XY interface panel. Set AGC INPUT COUNTERS switch to 1.

145. Press to extinguish CH33-10 pushbutton on RDC interface panel.

146. Press to extinguish TAPE FREE

RUN pushbutton on Programmer and Monitor panel. Press to light MONITOR pushbutton. AGC INPUT-CTR pushbutton shall go out.

147. Set Power switch on Tape Reader to OFF and remove tape. If alarms occur, press PROCEED and ALARM RESET pushbuttons on Programmer and Monitor panel and RESET pushbutton on DSKY.

148. Press to extinguish SELF TEST pushbutton on Self Test panel.

149. Remove Self Test Assembly from Buffer Box Assembly. Connect cable W21:8 to Buffer Box Assembly by connecting P2 of W226 to J4 on Buffer Box Assembly, P3 of W226 to J5 on Buffer Box Assembly, and P4 of W226 to J6 on Buffer Box Assembly.

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## CTS UPLINK TAPE LOAD PROCEDURES

- CHANNEL 2 to 10 MV/MM
- CHANNEL 3 to 20 MV/MM.

139. Set and hold SERVO TEST switch on TPA#2 to ON and adjust CAL ADJ control on Channel 3 Oscillograph Amplifier to obtain a step input amplitude A (See figure 3) of 20mm. Continue holding SERVO TEST switch to ON.

140. Start Oscillograph by setting CHART DRIVE switch on Oscillograph Control panel to MM/SEC.

141. After observing a constant servo error on Channel 3 of Oscillograph, release SERVO TEST switch. Observe Oscillograph trace for an additional constant servo error then set CHART DRIVE switch to OFF.

142. Determine and record the number of error signal oscillation peaks outside  $\pm 1\text{mm}$  of the final value. (See Figure 3.) Record magnitude A. Record the time ( $t_p$ ) for the error signal to reach and stay within 1mm of its final value.

## NORMALIZATION OF SYSTEM

143. Perform following DSKY operations:

- VERB 41 NOUN 20 ENTR

Observe:  
VERB 21 NOUN 22 Flashing ENTR

143A. When VERB 21 NOUN 22 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

- +00000

Observe:  
VERB 22 NOUN 22 Flashing ENTR

- +00000

Observe:  
VERB 23 NOUN 22 Flashing ENTR

- +00000

## NORMALIZATION OF SYSTEM

143. Press EXECUTE pushbutton on

Programmer and Monitor panel.

143A. When VERB 21 NOUN 22 flash on DSKY, press EXECUTE pushbutton on Programmer and Monitor panel.

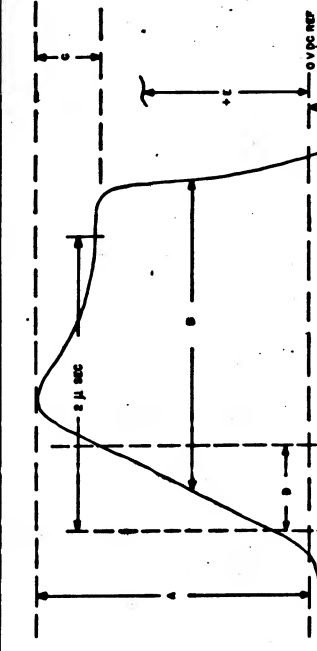
143B. When VERB 22 NOUN 22 flash on

DSKY, press EXECUTE pushbutton on

Programmer and Monitor panel.

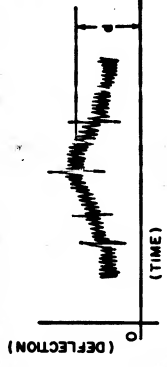
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SUBSYSTEM LEM G&N SYSTEM	ASSY
MANUAL LOAD PROCEDURES	



A - Amplitude: measured to pulse maximum positive level  
B - Pulse width: measured at A/2 level  
C - Droop: measured from pulse maximum positive level to level at 2 microseconds  
D - Rise Time: time required for pulse to rise from 10% to 90% of A.  
E - Noise; (No pulse)

Figure 1. Waveform Description



1 = 0.2d  
Where: 0.2 is Oscillograph sensitivity in volts per centimeter.  
d is deflection in centimeters measured from zero reference to midpoint of trace. Ignore any noise spikes.

Figure 2.

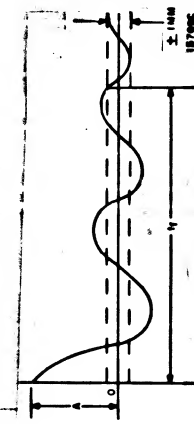


Figure 3.

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APOLLO 68N  
EQUIPMENT TEST  
DATA SHEET 1 OF 6

JDC  
NO. 12619  
REV. R  
INITIAL TORR 27134

JOB GIMBAL RESPONSE TEST

ASSEMBLY UNDER TEST		TEST HISTORY	
TITLE	DATE	START	END
SER. NO.	DWG	REV.	SITE / LOCATION
TIME		START	END
TOTAL ELAPSED			
MAJOR GROUND SUPPORT EQUIPMENT			
NAME	SER. NO.	CAL DATE	
NAME	SER. NO.	CAL DATE	
CONDUCTED BY		APPROVED BY	
NAME / AFFILIATION		NAME / AFFILIATION	

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ ACC
3	28 VDC Bus voltage	vdc	27.75		28.25	
9	PHASE GENER-ATOR	deg				
15	3200 CPS readout	deg				
17	PHASE GENER-ATOR	deg				
24	IG error phase shift	deg				
27	IG error in-phase null	mv	-60		+60	
33	PHASE GENER-ATOR	deg				
	3200 CPS readout					

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APOLLO 68N  
EQUIPMENT TEST  
DATA SHEET 2 OF 6

JDC  
NO. 12619  
REV. R

JOB GIMBAL RESPONSE TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ ACC
35	PHASE GENER-ATOR	deg				
42	3200 CPS readout	deg				
45	MG error in-phase shift	mv	-60		+60	
51	PHASE GENER-ATOR	deg				
53	3200 CPS readout	deg				
60	OG error phase shift	deg				
63	OG error in-phase null	mv	-60		+60	
64.a	Total OG TDA	volts			10	
64.b	Total MG TDA	volts			10	
64.c	Total IG TDA	volts			10	
72	OG - Δ9 abort	Refer to fig 1				
72.a.A	Amplitude	peak volts	4		10	
72.a.B	Pulse width	μsec	2		4	
72.a.C	Droop	volts			$\frac{A}{5}$	
72.a.D	Rise Time	μsec			0.5	

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APOLLO 68N  
EQUIPMENT TEST  
DATA SHEET 3 OF 6

JDC  
NO. 12619  
REV. R

JOB GIMBAL RESPONSE TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ ACC
72.a.E	Noise with respect to 0 vdc reference	volts	-4.0		+4.0	
72.b	IRIG PVR	vdc				
72.c	IRIG Torque Current Monitor	vdc				
72.d	IRIG SF voltage	vdc				
79	OG + Δ9 abort	Refer to fig 1				
79.A	Amplitude	peak volts	4		10	
79.B	Pulse width	μsec	2		4	
79.C	Droop	volts			$\frac{A}{5}$	
79.D	Rise Time	μsec			0.5	
79.E	Noise with respect to 0 vdc reference	volts	-4.0		+4.0	
80	OG CDU Fine Error on CH3	volt rms	-0.070		+0.070	
80	OG TM Current CH4	amps	-0.125		+0.125	
80	OG CDU Coarse Error on CH5	volt rms	-0.680		+0.680	
90	IG - Δ9 abort	Refer to fig 1				
90.A	Amplitude	peak volts	4		10	
90.B	Pulse width	μsec	2		4	
90.C	Droop	volts			$\frac{A}{5}$	

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FORM 00147  
Chg. 8-29-66

APOLLO 68N  
EQUIPMENT TEST  
DATA SHEET 4 OF 6

JDC  
NO. 12619  
REV. R

JOB GIMBAL RESPONSE TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ ACC
90.D	Rise Time	μsec			0.5	
90.E	Noise with respect to 0 vdc reference	volts	-4.0		+4.0	
97	IG + Δ9 abort	Refer to fig 1				
97.A	Amplitude	peak volts	4		10	
97.B	Pulse width	μsec	2		4	
97.C	Droop	volts			$\frac{A}{5}$	
97.D	Rise Time	μsec			0.5	
97.E	Noise with respect to 0 vdc reference	volts	-4.0		+4.0	
98	IG CDU Fine Error on CH1	volt rms	-0.070		+0.070	
98	IG TM Current on CH4	amps	-0.125		+0.125	
98	IG CDU Coarse Error on CH5	volt rms	-0.680		+0.680	
108	MG - Δ9 abort	Refer to fig 1				
108.A	Amplitude	peak volts	4		10	
108.B	Pulse width	μsec	2		4	
108.C	Droop	volts			$\frac{A}{5}$	
108.D	Rise Time	μsec			0.5	

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APOLLO 68N  
EQUIPMENT TEST  
DATA SHEET 5 OF 6

JDC  
NO. 12619  
REV. R

JOB GIMBAL RESPONSE TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ ACC
108.E	Noise with respect to 0 vdc reference	volts	-4.0		+4.0	
115	MG + $\Delta$ abort	Refer to fig 1				
115.A	Amplitude	peak volts	4		10	
115.B	Pulse width	$\mu$ sec	2		4	
115.C	Droop	volts			$\frac{A}{5}$	
115.D	Rise Time	$\mu$ sec			0.5	
115.E	Noise with respect to 0 vdc reference	volts	-4.0		+4.0	
116	MG CDU Fine Error on CH2	volt rms	-0.070		+0.070	
116	MG TM Current on CH4	amps	-0.125		+0.125	
116	MG CDU Coarse Error on CH5	volt rms	-0.680		+0.680	
128	Oscillation peaks				3	
	Magnitude A	mm				
	$t_f$	ms			100	
135	Oscillation peaks				3	
	Magnitude A	mm				
	$t_f$	ms			100	

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APOLLO 68N  
EQUIPMENT TEST  
DATA SHEET 6 OF 6

JDC  
NO. 12619  
REV. R

JOB GIMBAL RESPONSE TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ ACC
142	Oscillation peaks				5	
	Magnitude A	mm				
	$t_f$	ms			100	
	AGC Displays	All DSKY displays and indications reacted as specified				

DATE 15 MAR 68



SUBSYSTEM	LEM G & N SYSTEM	ASSY
38. Set the sensitivities on the Oscillograph Amplifier as follows:		1. VERB 24 NOUN 01 ENTR j. 00411 ENTR k. VERB 21 NOUN 01 Flashing ENTR l. 14000 ENTR m. VERB 22 NOUN 01 Flashing ENTR n. 00000 ENTR
39. Set the chart speed to 1 on the Oscillograph Control panel and set CHART DRIVE to MM/SEC.		44. Remove the jumper from J2-A of the Auxiliary Input panel and place it on J2-D to monitor MG -Δθ abort signal on the oscilloscope. 45. Remove the jumper from TE 2-31 and place it on TRA-2-32 of TPA #2. 46. Remove the jumper from TE 2-47 and place it on TB 2-41 of TPA #2. 47. Set CHANNEL 2 on the Oscillograph Signal Selector panel to 5 and CHANNEL 4 and 5 to AUX and monitor the following signals: a. MG CDU Fine Error on CHANNEL 2 b. MG TM Current on CHANNEL 4 c. MG CDU Coarse Error on CHANNEL 5. 48. Insure that CH2AC, CHADC and CH5AC pushbuttons on the Oscillograph Signal Selector panel are lighted. 49. Set the sensitivities on the Oscillograph Amplifiers as follows: a. CHANNEL 2 to 5 MV/MM b. CHANNEL 4 to 10 MV/MM c. CHANNEL 5 to 50 MV/MM 50. Set the chart speed to 1 on the Oscillograph Control panel and set CHART SPEED to MM/SEC. 51. Perform the following DSKY operations: VERB 43 ENTR VERB 33 ENTR
40. Perform the following DSKY operations:		VERB 42 ENTR VERB 33 ENTR
41. Measure and record the oscilloscope indications of A through E as represented on figure 1.		
42. When the Inner Gimbal indication on the Gimbal Position Control panel appears to stop, stop the Oscillograph and record the maximum amplitude (neglect spikes) of CHANNELS 1, 4 and 5 on the data sheets. Set all sensitivities on the Oscillograph Amplifier to OFF.		
43. Perform the following DSKY operations:		a. VERB 41 NOUN 20 ENTR b. VERB 21 NOUN 22 Flashing ENTR c. +00000 ENTR d. VERB 22 NOUN 22 Flashing ENTR e. +00000 ENTR f. VERB 23 NOUN 22 Flashing ENTR g. +06750 ENTR h. VERB 41 NOUN 22 Displayed ENTR

DATE \_\_\_\_\_

SUBSYSTEM	LEM G & N SYSTEM	ASSY
NOTE: Perform step 52 as quickly as possible as measurement time is limited to approximately 4 minutes. If measurement cannot be completed before pulse torquing ends turn the oscillograph off and repeat steps 43 and 51 and complete measurements not taken.		55. Remove the jumper from J2-D of the Auxiliary Input panel and place it on J2-C to monitor MG -Δθ abort signal on the scope. 56. Set the sensitivities on the Oscillograph Amplifier as follows: a. CHANNEL 2 to 5 MV/MM b. CHANNEL 4 to 10 MV/MM c. CHANNEL 5 to 50 MV/MM. 57. Set the chart speed to 1 on the Oscillograph Control panel and set CHART SPEED to MM/SEC. 58. Perform the following DSKY operations: VERB 42 ENTR VERB 33 ENTR NOTE: Perform step 59 as quickly as possible as measurement time is limited to approximately 2 minutes. If measurement cannot be completed before pulse torquing ends turn the oscillograph off and repeat steps 54 and 58 and complete measurements not taken. 59. Measure and record the oscilloscope indications of A through E as represented in figure 1. 60. When the Middle Gimbal indication on the Gimbal Position Control panel appears to stop, stop the Oscillograph and
52. Measure and record the oscilloscope indication of A through E as represented on figure 1.		
53. When the Middle Gimbal Indicator on the Gimbal Position Control panel appears to stop, stop the Oscillograph. Set all sensitivities on the Oscillograph to OFF.		
54. Perform the following DSKY operations:		a. VERB 41 NOUN 20 ENTR b. VERB 21 NOUN 22 Flashing ENTR c. +00000 ENTR d. VERB 22 NOUN 22 Flashing ENTR e. +00000 ENTR f. VERB 23 NOUN 22 Flashing ENTR g. -06750 ENTR h. VERB 41 NOUN 22 Displayed ENTR i. VERB 43 NOUN 01 ENTR j. 00411 ENTR k. VERB 21 NOUN 01 Flashing ENTR l. 54000 ENTR m. VERB 22 NOUN 01 Flashing ENTR n. 40000 ENTR

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SUBSYSTEM	LEM G & N SYSTEM	ASSY
66. Set the PHASE SHIFT SELECTOR on the phase sensitive Demodulators of CHANNELS 1, 2 and 3 to 3200 ~ 0 deg.		
67. Connect a jumper between:		TPA #2 TB 5-27 and TPA #2 TB 2-11
68. Perform the following DSKY operations:		a. VERB 41 NOUN 20 ENTR b. Observe VERB 21 NOUN 22 Flashing ENTR c. +00000 ENTR d. Observe VERB 22 NOUN 22 Flashing ENTR e. +00000 ENTR f. Observe VERB 23 NOUN 22 Flashing ENTR g. +00000 ENTR h. Observe VERB 41 NOUN 20 Displayed ENTR i. VERB 36 ENTR 69. Start the Oscillograph by setting the CHART DRIVE switch to MM/SEC. 70. Set and hold the SERVO TEST switch on the TPA #2 in the up position. 71. After a constant servo error is observed on CHANNEL 1 of the Oscillograph, release the SERVO TEST switch on TPA #2. 72. After a constant servo error is observed on CHANNEL 1 of the Oscillograph, stop the Oscillograph. 73. Record the IG stabilization loop response time on CHANNEL 1 of the Oscilloscope Chart by measuring the time interval between releasing the SERVO TEST switch
69. Set the following controls on the Oscillograph Signal Selector panel to monitor the associated signals:		
CHANNEL Position	Signal	
a. 1-2	IG & Y Gyro Error Signal	
b. 2-2	MG Error Signal	
c. 3-2	OG Error Signal	
64. Insure that CH5AC pushbutton on the Oscillograph Signal Selector panel is lit.		
65. Press the CHART SPEEDS 5 pushbutton on the Oscillograph Control panel and set the following channel sensitivities on the Oscillograph Amplifier panel:		
Channel	Sensitivity	
a. 1	50 MV/MM	
b. 2	10 MV/MM	
c. 3	10 MV/MM	

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SUBSYSTEM	LEM G & N SYSTEM	ASSY
78. After a constant servo error is observed on CHANNEL 2 of the Oscillograph, release the SERVO TEST switch on the TPA #2.		
79. After a constant servo error is observed on CHANNEL 2 of the Oscillograph, stop the Oscillograph.		
80. Record the MG stabilization loop response time on CHANNEL 2 of the Oscilloscope Chart by measuring the time interval between releasing the SERVO TEST switch and the peak magnitude of the first overshoot. In addition, record the number of overshoots after the initial disturbance.		
OG STEP RESPONSE		
81. Set the following channel sensitivities on the Oscillograph Amplifier panel:		
Channel	Sensitivity	
a. 1	10 MV/MM	
b. 2	10 MV/MM	
c. 3	50 MV/MM	
82. Remove the jumper of step 75 and connect as follows:		TPA #2 TB 5-18 and TPA #2 TB 2-4
83. Perform the following DSKY operations:		a. VERB 41 NOUN 20 ENTR b. Observe VERB 21 NOUN 22 Flashing ENTR c. +00000 ENTR d. Observe VERB 22 NOUN 22 Flashing ENTR e. +00000 ENTR f. Observe VERB 23 NOUN 22 Flashing ENTR g. +00000 ENTR h. Observe VERB 42 NOUN 22 Displayed ENTR i. VERB 36 ENTR 77. Set and hold the SERVO TEST switch on the TPA #2 in the up position.

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SUBSYSTEM LEM G & N SYSTEM

ASSY

overshoot. In addition, record the number of overshoots after the initial disturbance.

NORMALIZATION OF SYSTEM

88. Perform the following DSKY operation:

a. VERB 36 ENTR

89. Perform the following DSKY operations:

a. VERB 41 NOUN 20 ENTR

b. Observe

VERB 21 NOUN 22 Flashing

c. +00000 ENTR

d. Observe

VERB 22 NOUN 22 Flashing

e. +00000 ENTR

f. Observe

VERB 23 NOUN 23 Flashing

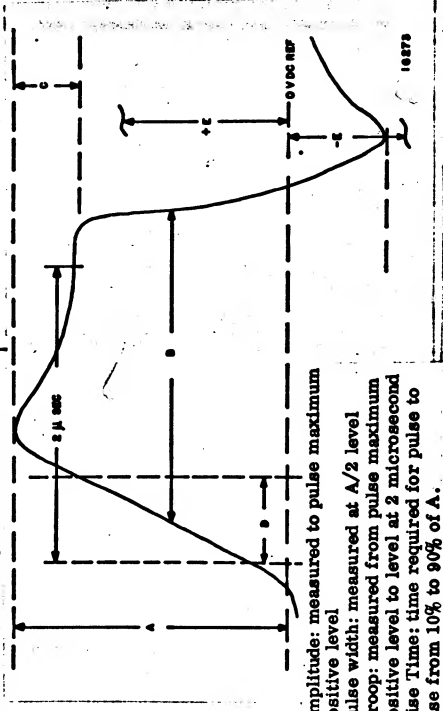
g. +00000 ENTR

84. Set and hold the SERVO TEST switch on the TPA #2 in the up position.

85. After a constant servo error is observed on CHANNEL 3 of the Oscillograph, release the SERVO TEST switch on the TPA #2.

86. After a constant servo error is observed on CHANNEL 3 of the Oscillograph, stop the Oscillograph.

87. Record the OG stabilization loop response time on CHANNEL 3 of the Oscillograph Chart by measuring the time interval between releasing the SERVO TEST switch and the peak magnitude of the first



A - Amplitude: measured to pulse maximum positive level  
B - Pulse width: measured at A/2 level  
C - Droop: measured from pulse maximum positive level to level at 2 microsecond rise time  
D - Rise Time: time required for pulse to rise from 10% to 90% of A.  
E - Noise: (No pulse)

Figure 1. Waveform Description

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JOB GIMBAL RESPONSE TEST TDRK 27134 MAR 15 1966

NO. 12619  
REV. -  
INITIAL TDRR

ASSEMBLY UNDER TEST

TITLE DATE START END SITE/LOCATION

SER. NO. DWG REV. TIME START END TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT

NAME SER. NO. CAL DATE

NAME SER. NO. CAL DATE

CONDUCTED BY NAME/AFFILIATION APPROVED BY NAME/AFFILIATION

JDC ITEM NO. PARAMETER UNITS MIN VALUE MAX VALUE REJ ACC

4 28 VDC Bus voltage vdc 27.75 28.25

6.a OG Error signal\*\* mv 60

6.b MG Error signal\*\* mv 60

6.c IG Error signal\*\* mv 60

6.d X Gyro Error signal\*\* mv 60

6.e Z Gyro Error signal\*\* mv 60

7.a OG TDA vdc 20 p-p

7.b MG TDA vdc 20 p-p

7.c IG TDA vdc 20 p-p

16 OG - Δ abort Refer to fig 1

16.a.A Amplitude peak volts 4 10

16.a.B Pulse width μsec 2 4

16.a.C Droop volts A 5

16.a.D Rise Time μsec 0.5

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JOB GIMBAL RESPONSE TEST

NO. 12619  
REV. -

ASSEMBLY UNDER TEST

TITLE DATE START END SITE/LOCATION

SER. NO. DWG REV. TIME START END TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT

NAME SER. NO. CAL DATE

NAME SER. NO. CAL DATE

CONDUCTED BY NAME/AFFILIATION APPROVED BY NAME/AFFILIATION

JDC ITEM NO. PARAMETER UNITS MIN VALUE MAX VALUE REJ ACC

34.E Noise with respect to 0 vdc reference volts -4.0

41 IG + Δ abort Refer to fig 1

41.A Amplitude peak volts 4 10

41.B Pulse width μsec 2 4

41.C Droop volts A 5

41.D Rise Time μsec 0.5

41.E Noise with respect to 0 vdc reference volts -4.0

42 IG CDU Fine Error on CH1 rms -0.070

42 IG TM Current on CH4 vdc -0.125

42 IG CDU Coarse Error on CH5 rms -0.680

52 MG - Δ abort Refer to fig 1

52.A Amplitude peak volts 4 10

52.B Pulse width μsec 2 4

52.C Droop volts A 5

52.D Rise Time μsec 0.5

52.E Noise with respect to 0 vdc reference volts -4.0

59 MG + Δ abort Refer to fig 1

DATE

JOB GIMBAL RESPONSE TEST

NO. 12619  
REV. -

ASSEMBLY UNDER TEST

TITLE DATE START END SITE/LOCATION

SER. NO. DWG REV. TIME START END TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT

NAME SER. NO. CAL DATE

NAME SER. NO. CAL DATE

CONDUCTED BY NAME/AFFILIATION APPROVED BY NAME/AFFILIATION

JDC ITEM NO. PARAMETER UNITS MIN VALUE MAX VALUE REJ ACC

34.E Noise with respect to 0 vdc reference volts -4.0

41 IG + Δ abort Refer to fig 1

41.A Amplitude peak volts 4 10

41.B Pulse width μsec 2 4

41.C Droop volts A 5

41.D Rise Time μsec 0.5

41.E Noise with respect to 0 vdc reference volts -4.0

42 IG CDU Fine Error on CH1 rms -0.070

42 IG TM Current on CH4 vdc -0.125

42 IG CDU Coarse Error on CH5 rms -0.680

52 MG - Δ abort Refer to fig 1

52.A Amplitude peak volts 4 10

52.B Pulse width μsec 2 4

52.C Droop volts A 5

52.D Rise Time μsec 0.5

52.E Noise with respect to 0 vdc reference volts -4.0

59 MG + Δ abort Refer to fig 1

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APOLLO 8/N  
EQUIPMENT TEST  
DATA SHEET 4 OF 4

JDC  
NO. 12619  
REV. -

JOB GIMBAL RESPONSE TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ ACC
59.A	Amplitude	peak volts	4		10	
59.B	Pulse width	$\mu$ sec	2		4	
59.C	Droop	volts			4	
59.D	Rise Time	$\mu$ sec			0.5	
59.E	Noise with respect to 0 vdc reference	volts	-4.0		+4.0	
60	MG CDU Fine Error on CH2	volt rms	-0.070		+0.070	
60	MG TM Current on CH4	vdc	-0.125		+0.125	
60	MG CDU Coarse Error on CH5	volt rms	-0.680		+0.680	
73	IG stabilization loop response	sec	0		0.8	
	Number of over- shoots	number	0		2	
80	MG stabilization loop response	sec	0		0.8	
	Number of over- shoots	number	0		2	
87	OG stabilization loop response	sec	0		0.8	
	Number of over- shoots	number	0		2	
	AGC Displays	All DSKY displays and indications reacted as specified				

DATE

FOR UNIT  
CHG.

SUBSYSTEM LEM G & N SYSTEM				ASSY
DESCRIPTION: This JDC provides a functional checkout procedure for the Signal Conditioner Module. Functional operation is evaluated by checking Signal Conditioner Module input and output data for proper correlation. Procedural methods are incorporated to cause signal generation in normally muted loops where possible in a G and N test configuration for maximum checkout capability.				
Rev.	Date	NO.	PAGES REVISED	REFERENCES
A	8-24-87	34449	JDC ALL	MIT NASA EAV - JDC 12614
				IMPORTANT
				INTERVAL
				TOOLS AND MATERIAL

A. PREPARATION

NOTE: If SCA has been previously installed in system configuration prior to the performance of this JDC, proceed with step A. 7. If installation is required, proceed with step A. 1.

1. Perform, if applicable, JDC 12614 to downmode to OIA on mode.

2. Remove the DSKY Mounting Pedestal and DSKY from the Component Mounting Plate following detachment of ground strap and demating of cable W143 to DSKY.

CAUTION: Extreme care must be exercised when mating connectors to

prevent pin and socket damage.

3. Visually inspect J2 on Signal Conditioner Module (SCM) breakout box and 3W1 on SCA to insure that pins and sockets are not bent or damaged.

4. Carefully locate J2 on guide pins of 3021; ease plug onto connector, maintaining parallelism between plug and connector as closely as possible; and engage jack screws until finger tight.

5. Turn each jack screw one turn at a time moving around connector in sequence until plug and connector are fully engaged.

6. Reinstall DSKY Mounting Pedestal with DSKY on the Component Mounting Plate, attach ground strap and mate cable W143 to DSKY.

VERIFICATION WITH SID REQUIRED BEFORE USE

DATE 26 JAN 87

SUBSYSTEM LEM G & N SYSTEM				ASSY
7. Perform JDC 12614 to place the G and N system in DSKY STANDBY mode with the LGC operating.				
8. Connect PSA Test Point Adapter (TPA #2) direct probes to TBI-29 (h) and TBS-22 (lo).				
9. Connect jumper between PROBES OUTPUT DIRECT Jacks and DVM IN Jacks on Auxiliary Input Panel.				
10. On Primary Signal Selector panel, set CROSSBAR CONTROL switches to 120 and adjust G & N Power Adjust control on Test Control panel until DVM indicates 28 (±0.25) vdc. Record DVM indication.				
B. PROCEDURE				
28 VDC STANDBY AND LGC OPERATE				
1. Connect SCA GSE Distribution Box (GDB) stepper switch to DVM by setting CROSSBAR CONTROL switches on Primary Signal Selector panel to 271.				
NOTE: To position Test Selector panel, perform following operations:				
a. Press SIGNAL CONTROLLER LEVEL 1				
ENABLE pushbutton if first digit on Test Selector panel position is 1, or press SIGNAL CONDITIONER LEVEL 2 ENABLE pushbutton if first digit is 2.				
b. Press PUSH TO ADVANCE pushbutton until display indicates last two digits.				
4. Insure that CH AC indicators are lighted for channels 4, 5, and 6.				
5. Set Phase Selector switch on demods to variable and zero oscillograph channels 4, 5, and 6. Set gains at 500 mv/mm following adjustments.				
6. Set gain of oscillograph channel 8 at 2 v/cm and zero adjust channel 8 for a centered trace with a 2.5 vdc bias input by off-setting zero line 12.5 mm to right of center line.				
7. Insure that PROCEED indicator of PROCEED/ISS OPERATE pushbutton on				

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SUBSYSTEM LEM G & N SYSTEM

Test Control panel is lighted and the STANDBY requirements of JDC 12614 have been satisfied.

8. Press CHART SPEEDS 5 pushbutton on Oscillograph Control panel and set CHART DRIVE switch to cm/hr.

9. Obtain oscillograph record of PIPA loop closure data by performing following steps successively for each position of Test Selector panel listed in table 1:

a. After a minimum of 5 minutes in ISS STANDBY mode, set CHART DRIVE switch on oscillograph control panel to MM/SEC and press PROCEED/ISS OPERATE pushbutton on Test Control panel.

b. Wait at least 10 seconds following PIPA loop closure when in tests a and b, then press the PROCEED/ISS STANDBY pushbutton. Following test c, allow system to remain in ISS OPERATE mode.

c. Following each test, set Chart Drive switch on oscillograph control panel to cm/hr. Check oscillograph recording for indications of PIPA loop closure on channel 8 correlating to the loop closure indications on channels 4, 5 and 6 respectively. Record that traces have centered after loop closure.

ASSY

Table I

Test	Test Selector Panel Position	Signal
a	117	Z PIPA S/G in-phase output
b	118	Y PIPA S/G in-phase output
c	119	X PIPA S/G in-phase output

10. On the Primary Signal Selector panel, set the CROSSBAR CONTROL switches to 173 and adjust the G and N Power Adjust control on the Test Control panel until the DVM indicates 28 (±0.25) vdc. Record DVM indication. Following measurement, return CROSSBAR CONTROL switches to 271.

11. Set Test Selector panel to positions indicated and measure and record following voltages on DVM:

NOTE: The SCA Test inhibit indicator on the Temperature Monitor Control panel will illuminate when the Test Selector Crossbar is in positions 201 and 202. Following measurements in these positions, push Signal Conditioner Level 2 Enable pushbutton and verify that the above inhibit indicator extinguishes.

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SUBSYSTEM LEM G & N SYSTEM				ASSY		
13. Connect following signals to oscillograph by setting following switches on Oscillograph Signal Selector panel to positions indicated:						
Test Selector Panel Position	Cal. Mod. Temperature	Switch	Signal			
*135	(GG6020T)	CHANNEL 1 to 2	IG servo error (GG2107V)			
*145	R & D 2.5 vdc bias (GG1111V)	CHANNEL 2 to 2	MG servo error (GG2137V)			
*150	IMU Heater Current (GG2302X)	CHANNEL 3 to 2	OG servo error (GG2167V)			
201	PIPA Temperature (GG2300T)	CHANNEL 8 to 4	SCA GDB stepper switch			
*202	IRIG Temperature (GG2301T)	14. Insure that CH 3 AC indicator is lighted.				
103	120 vdc Reference (GG1040V)					
104	2.5 vdc PCM bias (GG1110V)					
106	3200 cps 28 volt supply (GG1331V)					
113	800 cps 28 volt supply (GG1201V)					
IG, MG, AND OG SERVO ERRORS						
12. Perform following DSKY operations:						
a. VERB 36	ENTR				15. Set Phase Selector switch on demods to 3200 cps and zero oscillograph channels 1, 2, and 3. Following adjustments, set gains at 100 mv/mm. Set gain of channel 8 at 2 v/cm and zero adjust channel 8 for a centered trace with a 2.5 vdc bias input, by off-setting the zero line 12.5 mm to right of chart center line.	
b. VERB 41	NOUN 20					
c. Observe:						
VERB 21	NOUN 22					
d. +00000	ENTR					
e. Observe:						
VERB 22	NOUN 22					
f. +00000	ENTR					
g. Observe:						
VERB 23	NOUN 22					
h. +00000	ENTR					
*Parameters not available in LEM Operational SCA, P/N 6007013-011.						
16. Press CHART SPEEDS 5 pushbutton on Oscillograph Control panel.						
17. Set switches on Signal Generator as follows:						
FUNCTION to SINE						
RANGE to X.1						
FREQUENCY meter to 2.						
Set the OSS channel 5 to 1 DC. Use the DC balance control on the Signal Generator to center the trace about zero reference on the Oscillograph.						

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ASSY			
18. Perform following DSKY operations:			
a. VERB 43	ENTR		
b. VERB 33	ENTR		
19. Set CHART DRIVE switch on Oscillograph Control panel to MM/SEC.			
20. Press Gimbal Servo Test pushbutton on Test Selector panel. The pushbutton shall light.			
21. Obtain an oscillograph trace of stabilization loop servo error data by performing the following steps for each test listed in table II.			
Test	Gimbal Servo Test Switch Position	Test Selector Panel Position	Signal
a	1	137	IG servo error
b	2	138	MG servo error
c	3	139	OG servo error

\* IG, MG, AND OG TORQUE MOTOR CURRENTS (GG2110C, 2140C, and 2170C)

\*24. Insure that AMPLITUDE control on Signal Generator is set to 0.

\*25. Connect jumper between PROBES OUTPUT DIRECT jacks and CH 6 DC IN jacks on Auxiliary Input panel.

\*26. Set OSCILLOGRAPH SELECTOR CHANNEL 6 switch on Oscillograph Signal Selector panel to AUX.

\*27. Insure that CH 6 DC indicator is lighted.

\*28. Zero oscillograph channel 6 and set gain at 0.2 v/cm. Set gain of channel 8 at 2 v/cm and zero adjust channel 8 for a centered trace with a 2.5 vdc bias input by off-setting zero line 12.5 mm to right of chart center line.

\*29. Set FREQUENCY meter on Signal Generator to 5 and RANGE switch to X10.

\*30. Set CHART DRIVE switch on Oscillograph Control panel to MM/SEC.

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ASSY			
*31. Set CROSSBAR CONTROL switches on Primary Signal Selector panel to 176 to monitor Signal Generator output on oscilloscope.			
*32. Press the Gimbal Servo Test pushbutton. The pushbutton shall light.			
*33. Obtain oscillograph trace of torque motor currents by performing the following steps for each test listed in table III.			
Test	Test Selector Panel Position	Test Selector Panel Position	Signal
a	1	137	IG servo error
b	2	138	MG servo error
c	3	139	OG servo error

\*Parameters not available in LEM Operational SCA, P/N 6007013-011

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ASSY			
Table III			
Test	Signal Generator Output	Test Selector Panel Position	Signal
a	2V peak-to-peak	132	1 IG torque motor out.
b	1V peak-to-peak	133	2 MG torque motor out.
c	1V peak-to-peak	134	3 OG torque motor out.

a. Observe:  
VERB 21 NOUN 23 Flashing

c. +00100

p. Observe:  
VERB 21 NOUN 23 Flashing

q. +00100

x. Observe:  
VERB 23 NOUN 23 Flashing

a. +00100

Table IV			
Test Site	Latitude		
MIT	+43.366		
ACSP	+42.902		
GABC	+40.746		
MSC	+28.556		
KBC	+28.516		
NAA	+35.921		

\*39. Within 10 to 90 seconds following step 38, a, perform the following DSKY operations:

a. VERB 21 NOUN 01 ENTR

b. 02512

c. 00000

d. VERB 16 NOUN 20 ENTR

\*Parameters not available in LEM Operational SCA, P/N 6007013-011

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ASSY			
Table VI			
Test	CROSSBAR CONTROL Position	Test Selector Panel Position	Signal
a	142	203	OG 1X resolver sin $\pm 10^\circ$
b	144	204	IG 1X resolver sin $\pm 10^\circ$
c	145	205	MG 1X resolver sin $\pm 10^\circ$

IG, MG, AND OG 1X RESOLVER SIN AND COS

a. VERB 41 NOUN 20 ENTR

b. Observe:  
VERB 21 NOUN 23 Flashing

c. +04500

d. Observe:  
VERB 23 NOUN 23 Flashing

e. +04500

f. Observe:  
VERB 23 NOUN 23 Flashing

g. +04500

h. VERB 16 NOUN 20 ENTR

48. Monitor and record the contents of  $R_1$ ,  $R_2$ , and  $R_3$ .

49. Alternately connect SCA output and SCA input to DVM for each test listed in table VII. For each test, perform following operations:

a. Set CROSSBAR CONTROL switches to 271.

b. Set Test Selector panel to position listed and record DVM indication.

c. Immediately set CROSSBAR CONTROL

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JOB LEM SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

ASSEMBLY UNDER TEST				TEST HISTORY			
TITLE	SER. NO.	DWG	REV.	DATE	START	END	SITE/LOCATION
				TIME	START	END	TOTAL ELN SED
MAJOR GROUND SUPPORT EQUIPMENT							
NAME	SER. NO.			CAL. DATE			
NAME	SER. NO.			CAL. DATE			
CONDUCTED BY				APPROVED BY			
NAME/AFFILIATION				NAME/AFFILIATION			

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ/ACC
A.10	Bus Voltage	VDC	27.75		28.25	
B.2	28 VDC LGC	VDC	3.9		4.8	
	Operate					
	28 VDC IMU	VDC	3.9		4.8	
	Standby					
B.9	Loop Closure					
	Test a					
	Loop Closure					
	Test b					
	Loop Closure					
	Test c					
B.10	Bus Voltage	VDC	27.75		28.25	
B.11	*Cal Module Temp.	VDC	0.40		1.26	
	*R&D 2.5 VDC Bias	VDC	2.47		2.53	
	*IMU Heater	VDC	3.9		4.80	
	Current					
	PIPA Temperature	VDC	2.0		3.0	
	*IRIG Temperature	VDC	2.37		3.70	
	120 VDC Reference	VDC	2.80		4.20	

\*Parameters not available in LEM Operational SCA,  
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JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ/ACC
B.11 (Cont)	2.5 VDC PCM Bias	VDC	2.47		2.53	
	3200 cps, 28V Supply	VDC	4.20		4.80	
	800 cps, 28V Supply	VDC	4.20		4.80	
B.23.a	IG Servo Error Channel 1	ΔV				
	IG Servo Error Channel 8	ΔV	Channel 1 -15%		Channel 1 +15%	
B.23.b	MG Servo Error Channel 2	ΔV				
	MG Servo Error Channel 8	ΔV	Channel 2 -15%		Channel 2 +15%	
B.23.c	OG Servo Error Channel 3	ΔV				
	OG Servo Error Channel 8	ΔV	Channel 3 -15%		Channel 3 +15%	
B.35.a	*IG TMC Channel 6	ΔV				
	*IG TMC Channel 8	ΔV	Channel 6 x 5.0 -15%		Channel 6 x 5.0 +15%	
B.35.b	*MG TMC Channel 6	ΔV				
	*MG TMC Channel 8	ΔV	Channel 6 x 5.0 -15%		Channel 6 x 5.0 +15%	

\*Parameters not available in LEM Operational SCA,  
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JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ/ACC
B.35.e	*OG TMC Channel 6	V P/P				
	*OG TMC Channel 8	V P/P	Channel 6 x 2.75 -15%		Channel 6 x 2.75 +15%	
B.40	*DSKY Row 1	Deg.				
	DSKY Row 2	Deg.				
	DSKY Row 3	Deg.				
B.41	*DSKY Row 1	Deg.				
	DSKY Row 2	Deg.				
	DSKY Row 3	Deg.				
B.42.a	*IG CDU Fine Error (PAVM)	VAC				
	*IG CDU Fine Error (DVM)	VDC				
B.42.b	*MG CDU Fine Error (PAVM)	VAC				
	*MG CDU Fine Error (DVM)	VDC				
B.42.c	*OG CDU Fine Error (PAVM)	VAC				
	*OG CDU Fine Error (DVM)	VDC				

\*Parameters not available in LEM Operational SCA,  
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JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ/ACC
B.46.a	*OG IX Resolver 8ln ±10°	VAC				
	*OG IX Resolver 8ln ±10°	VDC				
B.46.b	*MG IX Resolver 8ln ±10°	VAC				
	*MG IX Resolver 8ln ±10°	VDC				
B.46.c	*IG IX Resolver 8ln ±10°	VAC				
	*IG IX Resolver 8ln ±10°	VDC				
B.48	DSKY Row 1	Deg.				
	DSKY Row 2	Deg.				
	DSKY Row 3	Deg.				
B.49.a	IG IX Resolver (45°) Cos (Test A) (TES 120)	VDC				
	IG IX Resolver (45°) Cos (Test A) (XBR 245)	VAC				
B.49.b	MG IX Resolver (45°) Cos (Test B) (TES 121)	VDC				

\*Parameters not available in LEM Operational SCA,  
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JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ ACC
B. 49. b (cont)	MG IX Resolver (45°) Cos (Test B) (XBR 242)	VAC				
B. 49. c	OG IX Resolver (45°) Cos (Test C) (TES 122)	VDC				
	OG IX Resolver (45°) Cos (Test C) (XBR 241)	VAC				
B. 49. d	IG IX Resolver (45°) Sin (Test D) (TES 122)	VDC				
	IG IX Resolver (45°) Sin (Test D) (XBR 144)	VAC				
B. 49. e	MG IX Resolver (45°) Sin (Test E) (TES 124)	VDC				
	MG IX Resolver (45°) Sin (Test E) (XBR 143)	VAC				
B. 49. f	OG IX Resolver (45°) Sin (Test F) (TES 125)	VDC				

\*Parameters not available in LEM Operational SCA,  
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JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ ACC
B. 49. f (cont)	OG IX Resolver (45°) Sin (Test F) (XBR 142)	VAC				
B. 51	DSKY Row 1 DSKY Row 2 DSKY Row 3	Deg. Deg. Deg.				
B. 52. a	IG IX Resolver (135°) Cos (Test A) (TES 120)	VDC				
	IG IX Resolver (135°) Cos (Test A) (XBR 243)	VAC				
B. 52. b	MG IX Resolver (135°) Cos (Test B) (TES 121)	VDC				
	MG IX Resolver (135°) Cos (Test B) (XBR 242)	VAC				
B. 52. c	OG IX Resolver (135°) Cos (Test C) (TES 122)	VDC				
	OG IX Resolver (135°) Cos (Test C) (XBR 241)	VAC				

\*Parameters not available in LEM Operational SCA,  
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JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ ACC
B. 52. d	IG IX Resolver (135°) Sin (Test D) (TES 123)	VDC				
	IG IX Resolver (135°) Sin (Test D) (XBR 144)	VAC				
B. 52. e	MG IX Resolver (135°) Sin (Test E) (TES 124)	VDC				
	MG IX Resolver (135°) Sin (Test E) (XBR 143)	VAC				
B. 52. f	OG IX Resolver (135°) Sin (Test F) (TES 125)	VDC				
	OG IX Resolver (135°) Sin (Test F) (XBR 142)	VAC				
B. 54	DSKY Row 1 DSKY Row 2 DSKY Row 3	Deg. Deg. Deg.				
B. 55. a	IG IX Resolver (225°) Cos (Test A) (TES 120)	VDC				

\*Parameters not available in LEM Operational SCA,  
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JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ ACC
B. 55. a (cont)	IG IX Resolver (225°) Cos (Test A) (XBR 243)	VAC				
B. 55. b	MG IX Resolver (225°) Cos (Test B) (TES 121)	VDC				
	MG IX Resolver (225°) Cos (Test B) (XBR 242)	VAC				
B. 55. c	OG IX Resolver (225°) Cos (Test C) (TES 122)	VDC				
	OG IX Resolver (225°) Cos (Test C) (XBR 241)	VAC				
B. 55. d	IG IX Resolver (225°) Sin (Test D) (TES 123)	VDC				
	IG IX Resolver (225°) Sin (Test D) (XBR 144)	VAC				
B. 55. e	MG IX Resolver (225°) Sin (Test E) (TES 124)	VDC				

\*Parameters not available in LEM Operational SCA,  
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JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ ACC
B. 55.e (cont)	OG 1X Resolver (225°) Sin (Test E) (XBR 143)	VAC				
B. 55.f	OG 1X Resolver (225°) Sin (Test F) (TES 125)	VDC				
	OG 1X Resolver (225°) Sin (Test F) (XBR 142)	VAC				
B. 57	DSKY Row 1					
	DSKY Row 2					
	DSKY Row 3					
B. 56.a	IG 1X Resolver (315°) Cos (Test A) (TES 120)	VDC				
	IG 1X Resolver (315°) Cos (Test A) (XBR 243)	VAC				
B. 56.b	MG 1X Resolver (315°) Cos (Test B) (TES 121)	VDC				
	MG 1X Resolver (315°) Cos (Test B) (XBR 242)	VAC				

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JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ ACC
B. 58.e	OG 1X Resolver (315°) Cos (Test C) (TES 122)	VDC				
	OG 1X Resolver (315°) (Test C) (XBR 241)	VAC				
B. 58.d	IG 1X Resolver (315°) Sin (Test D) (TES 123)	VDC				
	IG 1X Resolver (315°) Sin (Test D) (XBR 144)	VAC				
B. 58.e	MG 1X Resolver (315°) Sin (Test E) (TES 124)	VDC				
	MG 1X Resolver (315°) Sin (Test E) (XBR 143)	VAC				
B. 58.f	OG 1X Resolver (315°) Sin (Test F) (TES 125)	VDC				
	OG 1X Resolver (315°) Sin (Test F) (XBR 142)	VAC				
B. 67	*Shaft CDU Fine Error	VDC	2.45		2.55	

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JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ ACC
B. 68	*Shaft CDU Fine Error	VDC	3.75		4.25	
B. 72	*Trunnion CDU Fine Error	VDC	3.75		4.25	
B. 73	*Trunnion CDU Fine Error	VDC	2.45		2.55	
B. 79	Trunnion 1X Resolver Sin (TES 126)	VDC	4.45		4.95	
	Trunnion 1X Resolver Cos (TES 131)	VDC	4.45		4.95	
B. 82	Shaft 1X Resolver Sin (TES 129)	VDC	4.45		4.95	
	Shaft 1X Resolver Cos (TES 130)	VDC	4.45		4.95	
B. 89.a	Yaw Attitude Error (PAVM)	VAC				
	Yaw Attitude Error (DVM) (TES 114)	VDC				
B. 89.b	Pitch Attitude Error (PAVM)	VAC				

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JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ ACC
B. 89.b (cont)	Pitch Attitude Error (DVM) (TES 115)	VDC				
B. 89.c	Roll Attitude Error (PAVM)	VAC				
	Roll Attitude Error (DVM) (TES 116)	VDC				
CALCULATIONS						
C. 1	$\text{*IG CDU fine error} = \frac{\text{SCA output (VDC)} - 2.5V \text{ R\&D bias}}{2.00 \times \text{SCA input (VAC)}} = 1 (\pm 10\%)$					
	$\text{*MG CDU fine error} = \frac{\text{SCA output (VDC)} - 2.5V \text{ R\&D bias}}{2.00 \times \text{SCA input (VAC)}} = 1 (\pm 10\%)$					
	$\text{*OG CDU fine error} = \frac{\text{SCA output (VDC)} - 2.5V \text{ R\&D bias}}{2.00 \times \text{SCA input (PAVM)}} = 1 (\pm 10\%)$					
C. 2	$\text{*OG 1X resolver sin } \pm 10^\circ = \frac{2 (\text{SCA output (VDC)} - 2.5V \text{ PCM bias})}{\text{SCA input (VAC)}} = 1 (\pm 10\%)$					

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CALCULATIONS	REJ	ACC
C.2 (cont)		
*MG 1X resolver sin $\pm 10^\circ = \frac{2 \text{ (SCA output (VDC) -2.5V PCM bias)}}{\text{SCA input (VAC)}}$ = 1 ( $\pm 10\%$ )		
*IG 1X resolver sin $\pm 10^\circ = \frac{2 \text{ (SCA output (VDC) -2.5V PCM bias)}}{\text{SCA input (VAC)}}$ = 1 ( $\pm 10\%$ )		
C.3		
IG 1X resolver cos $(45^\circ) = \frac{8.5 \text{ (SCA output (VDC)(B.49.a) -2.5V PCM bias)}}{\text{SCA input (VAC) (B.49.a)}}$ = 1 ( $\pm 10\%$ )		
MG 1X resolver cos $(45^\circ) = \frac{8.5 \text{ (SCA output (VDC)(B.49.b) -2.5V PCM bias)}}{\text{SCA input (VAC) (B.49.b)}}$ = 1 ( $\pm 10\%$ )		
OG 1X resolver cos $(45^\circ) = \frac{8.5 \text{ (SCA output (VDC)(B.49.c) -2.5V PCM bias)}}{\text{SCA input (VAC) (B.49.c)}}$ = 1 ( $\pm 10\%$ )		

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CALCULATIONS	REJ	ACC
C.3 (cont)		
IG 1X resolver sin $(45^\circ) = \frac{8.5 \text{ (SCA output (VDC)(B.49.d) -2.5V PCM bias)}}{\text{SCA input (VAC) (B.49.d)}}$ = 1 ( $\pm 10\%$ )		
MG 1X resolver sin $(45^\circ) = \frac{8.5 \text{ (SCA output (VDC)(B.49.e) -2.5V PCM bias)}}{\text{SCA input (VAC) (B.49.e)}}$ = 1 ( $\pm 10\%$ )		
OG 1X resolver sin $(45^\circ) = \frac{8.5 \text{ (SCA output (VDC)(B.49.f) -2.5V PCM bias)}}{\text{SCA input (VAC) (B.49.f)}}$ = 1 ( $\pm 10\%$ )		
IG 1X resolver cos $(135^\circ) = \frac{8.5 \text{ (SCA output (VDC)(B.52.a) -2.5V PCM bias)}}{\text{SCA input (VAC) (B.52.a)}}$ = 1 ( $\pm 10\%$ )		
MG 1X resolver cos $(135^\circ) = \frac{8.5 \text{ (SCA output (VDC)(B.52.b) -2.5V PCM bias)}}{\text{SCA input (VAC) (B.52.b)}}$ = 1 ( $\pm 10\%$ )		

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CALCULATIONS	REJ	ACC
C.3. (cont)		
OG 1X resolver cos $(135^\circ) = \frac{8.5 \text{ (SCA output (VDC)(B.52.c) -2.5V PCM bias)}}{\text{SCA input (VAC) (B.52.c)}}$ = 1 ( $\pm 10\%$ )		
IG 1X resolver sin $(135^\circ) = \frac{8.5 \text{ (SCA output (VDC)(B.52.d) -2.5V PCM bias)}}{\text{SCA input (VAC) (B.52.d)}}$ = 1 ( $\pm 10\%$ )		
MG 1X resolver sin $(135^\circ) = \frac{8.5 \text{ (SCA output (VDC)(B.52.e) -2.5V PCM bias)}}{\text{SCA input (VAC) (B.52.e)}}$ = 1 ( $\pm 10\%$ )		
OG 1X resolver sin $(135^\circ) = \frac{8.5 \text{ (SCA output (VDC)(B.52.f) -2.5V PCM bias)}}{\text{SCA input (VAC) (B.52.f)}}$ = 1 ( $\pm 10\%$ )		
IG 1X resolver cos $(225^\circ) = \frac{8.5 \text{ (SCA output (VDC)(B.55.a) -2.5V PCM bias)}}{\text{SCA input (VAC) (B.55.a)}}$ = 1 ( $\pm 10\%$ )		
MG 1X resolver cos $(225^\circ) = \frac{8.5 \text{ (SCA output (VDC)(B.55.b) -2.5V PCM bias)}}{\text{SCA input (VAC) (B.55.b)}}$ = 1 ( $\pm 10\%$ )		

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CALCULATIONS	REJ	ACC
C.3 (cont)		
OG 1X resolver cos $(225^\circ) = \frac{8.5 \text{ (SCA output (VDC)(B.55.c) -2.5V PCM bias)}}{\text{SCA input (VAC) (B.55.c)}}$ = 1 ( $\pm 10\%$ )		
IG 1X resolver sin $(225^\circ) = \frac{8.5 \text{ (SCA output (VDC)(B.55.d) -2.5V PCM bias)}}{\text{SCA input (VAC) (B.55.d)}}$ = 1 ( $\pm 10\%$ )		
MG 1X resolver sin $(225^\circ) = \frac{8.5 \text{ (SCA output (VDC)(B.55.e) -2.5V PCM bias)}}{\text{SCA input (VAC) (B.55.e)}}$ = 1 ( $\pm 10\%$ )		
OG 1X resolver sin $(225^\circ) = \frac{8.5 \text{ (SCA output (VDC)(B.55.f) -2.5V PCM bias)}}{\text{SCA input (VAC) (B.55.f)}}$ = 1 ( $\pm 10\%$ )		
IG 1X resolver cos $(315^\circ) = \frac{8.5 \text{ (SCA output (VDC)(B.58.a) -2.5V PCM bias)}}{\text{SCA input (VAC) (B.58.a)}}$ = 1 ( $\pm 10\%$ )		
MG 1X resolver cos $(315^\circ) = \frac{8.5 \text{ (SCA output (VDC)(B.58.b) -2.5V PCM bias)}}{\text{SCA input (VAC) (B.58.b)}}$ = 1 ( $\pm 10\%$ )		

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EQUIPMENT TEST  
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JOB LEM SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

JDC  
NO. 12610  
REV. A

CALCULATIONS	REJ	ACC
<p>C.3 (cont)</p> <p>OG 1X resolver cos (315°) = <math>\frac{8.5 \text{ (SCA output (VDC) (B.58.c) -2.5V PCM bias)}}{\text{SCA input (VAC) (B.58.c)}}</math></p> <p>= 1 (±10%)</p> <p>IG 1X resolver sin (315°) = <math>\frac{8.5 \text{ (SCA output (VDC) (B.58.d) -2.5V PCM bias)}}{\text{SCA input (VAC) (B.58.d)}}</math></p> <p>= 1 (±10%)</p> <p>MG 1X resolver sin (315°) = <math>\frac{8.5 \text{ (SCA output (VDC) (B.58.e) -2.5V PCM bias)}}{\text{SCA input (VAC) (B.58.e)}}</math></p> <p>= 1 (±10%)</p> <p>OG 1X resolver sin (315°) = <math>\frac{8.5 \text{ (SCA output (VDC) (B.58.f) -2.5V PCM bias)}}{\text{SCA input (VAC) (B.58.f)}}</math></p> <p>= 1 (±10%)</p>		
<p>C.4</p> <p>Yaw attitude error = <math>\frac{2.44 \text{ (SCA output (VDC) (B.89.a) -2.5V PCM bias)}}{\text{SCA input (VAC) (B.89.a)}}</math></p> <p>= 1 (±10%)</p>		

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JOB LEM SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

JDC  
NO. 12620  
REV. A

CALCULATIONS	REJ	ACC
<p>C.4 (cont)</p> <p>Pitch attitude error = <math>\frac{2.44 \text{ (SCA output (VDC) (B.89.b) -2.5V PCM bias)}}{\text{SCA input (VAC) (B.89.b)}}</math></p> <p>= 1 (±10%)</p> <p>Roll attitude error = <math>\frac{2.44 \text{ (SCA output (VDC) (B.89.c) -2.5V PCM bias)}}{\text{SCA input (VAC) (B.89.c)}}</math></p> <p>= 1 (±10%)</p>		

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SUBSYSTEM LEM G & N SYSTEM				ASSY.	
DESCRIPTION This JDC provides a functional checkout procedure for the Signal Conditioner Module. Functional operation is evaluated by checking Signal Conditioner Module input and output data for proper correlation. Procedural methods are incorporated to cause signal generation in normally nulled loops where possible in a G and N test configuration for m.a.-d-run checkout capability.					
REV.	DATE	TDRR NO.	PAGES REVISED	APPROVAL	REFERENCES
A	8-24-67	34449	JDC ALL	MIT NASA EA 1/2	PS 6015000 JDC 12614
B	8-31-67	34478	1, 2, 4-8, 10, 11, 13, 14 15-17	EA 2/2 -	IMPORTANT
					See below
					INTERVAL
					TOOLS AND MATERIAL

IMPORTANT: Step numbers preceded by an asterisk are not to be performed when testing with LEM Operational SCA, P/N 6007010-011. Perform all steps when testing with LEM Flight Qualification SCA, P/N 6007010-011.

A. PREPARATION

NOTE: If SCA has been previously installed in system configuration prior to the performance of this JDC, proceed with step A. 7. If installation is required, proceed with step A. 1.

1. Perform, if applicable, JDC 12614 to downmode to OIA on mode.
2. Remove the DSKY Mounting Pedestal and DSKY from the Component Mounting Plate following detachment of ground strap and demating of cable W143 to DSKY.

CAUTION: Extreme care must be exercised when mating connectors to prevent pin and socket damage.

3. Visually inspect J2 on Signal Conditioner Module (SCM) breakout box and 30J1 on SCA to insure that pins and sockets are not bent or damaged.
4. Carefully locate J2 on guide pins of 30J1; ease plug onto connector, maintaining parallelism between plug and connector as closely as possible; and engage jackscrews until finger tight.
5. Turn each jackscrew one turn at a time moving around connector in sequence until plug and connector are fully engaged.
6. Reinstall DSKY Mounting Pedestal with DSKY on the Component Mounting Plate, attach ground strap and mate cable W143 to DSKY.

VERIFICATION WITH SIDL REQUIRED BEFORE USE

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FOR TDRR  
Chg. 3-1-66

SUBSYSTEM LEM G & N SYSTEM				ASSY	
off-setting zero line 12.5 mm to right of center line.					
7. Insure that PROCEED Indicator of PROCEED/ISS OPERATE pushbutton on Test Control panel is lighted and the STANDBY requirements of JDC 12614 have been satisfied.					
8. Press CHART SPEEDS 5 pushbutton on Oscillograph Control panel and set CHART DRIVE switch to cm/hr.					
Table I					
Test	Test Selector Panel Position	Signal			
a	117	Z PIPA S/G in-phase output			
b	118	Y PIPA S/G in-phase output			
c	119	X PIPA S/G in-phase output			

10. On the Primary Signal Selector panel, set the CROSSBAR CONTROL switches to 173 and adjust the G and N Power Adjust control on the Test Control panel until the DVM indicates 28 (±0.25) vdc. Record DVM indication. Following measurement, return CROSSBAR CONTROL switches to 271.

11. Set Test Selector panel to positions indicated and measure and record following voltages on DVM:

NOTE: The SCA Test Inhibit Indicator on the Temperature Monitor Control panel will illuminate when the Test Selector Crossbar is in positions 201 and 202. Following measurements in these positions, push Signal Conditioner Level 2 Enable pushbutton and verify that the above inhibit indicator extinguishes.

b. Wait at least 10 seconds following PIPA loop closure when in tests a and b, then press the PROCEED/ISS STANDBY pushbutton. Following test c, allow system to remain in ISS OPERATE mode.

c. Following each test, set Chart Drive switch on oscillograph control panel to cm/hr. Check oscillograph recording for indications of PIPA loop closure on channel 8 correlating to the loop closure indications on channels 4, 5 and 6 respectively. Record that traces have centered after loop closure.

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SUBSYSTEM LEM G & N SYSTEM				ASSY	
<p>7. Perform JDC 12614 to place the G and N system in ISS STANDBY mode with the LGC operating.</p> <p>8. Connect PSA Test Point Adapter (TPA #2) direct probes to TBI-29 (H) and TBS-22 (L).</p> <p>9. Connect jumper between PROBES OUTPUT DIRECT Jacks and DVM IN Jacks on Auxiliary Input Panel.</p> <p>NOTE: The 28 VDC G &amp; N Power adjusted in the following step will vary as result of heater cycling.</p> <p>10. On Primary Signal Selector panel, set CROSSBAR CONTROL switches to 120 and adjust G &amp; N Power Adjust control on Test Control panel until DVM indicates 28 (±0.25) vdc. Record DVM indication.</p> <p>B. PROCEDURE</p> <p>1. Connect SCA GSE Distribution Box (GDB) stepper switch to DVM by setting CROSSBAR CONTROL switches on Primary Signal Selector panel to 271.</p> <p>NOTE: To position Test Selector panel, perform following operations:</p> <p>a. Press SIGNAL CONDITIONER LEVEL 1 ENABLE pushbutton if first digit on Test Selector panel position is 1, or press SIGNAL CONDITIONER LEVEL 2 ENABLE pushbutton if first digit is 2.</p>		b. Press PUSH TO ADVANCE pushbutton until display indicates last two digits.		b. Press PUSH TO ADVANCE pushbutton until display indicates last two digits.	
		2. Set Test Selector panel to positions indicated and measure and record the following voltages on DVM.		2. Set Test Selector panel to positions indicated and measure and record the following voltages on DVM.	
		Test Selector Panel Position		Voltage	
		101		28 vdc LGC operate (GG1523X)	
		102		28 vdc IMU standby (GG1513X)	
		PIPA S/G OUTPUT		PIPA S/G OUTPUT	
		3. Connect following signals to oscillograph by setting switches on Oscillograph Signal Selector panel to positions indicated:		3. Connect following signals to oscillograph by setting switches on Oscillograph Signal Selector panel to positions indicated:	
		Switch		Signal	
		CHANNEL 4 to 1		Z PIPA S/G output (GG9041V)	
		CHANNEL 5 to 1		Y PIPA S/G output (GG9021V)	
		CHANNEL 6 to 1		X PIPA S/G output (GG9001V)	
		CHANNEL 8 to 4		SCA GDB stepper switch	
		4. Insure that CH AC indicators are lighted for channels 4, 5, and 6.		4. Insure that CH AC indicators are lighted for channels 4, 5, and 6.	
5. Set Phase Selector switch on demods to variable and zero oscillograph channels 4, 5, and 6. Set gains at 500 mv/mm following adjustments.		5. Set Phase Selector switch on demods to variable and zero oscillograph channels 4, 5, and 6. Set gains at 500 mv/mm following adjustments.			
6. Set gain of oscillograph channel 8 at 2 v/cm and zero adjust channel 8 for a centered trace with a 2.5 vdc bias input by		6. Set gain of oscillograph channel 8 at 2 v/cm and zero adjust channel 8 for a centered trace with a 2.5 vdc bias input by			

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SUBSYSTEM LEM G & N SYSTEM				ASSY	
13. Connect following signals to oscillograph by setting following switches on Oscillograph Signal Selector panel to positions indicated:	Test Selector	Panel Position	Signal	13. Connect following signals to oscillograph by setting following switches on Oscillograph Signal Selector panel to positions indicated:	
	*136	Cal. Mod. Temperature (GG6020T)		CHANNEL 1 to 2	
	*145	R & D 2.5 vdc bias (GG1111V)		IG servo error (GG2107V)	
	*150	IMU Heater Current (GG2302X)		MG servo error (GG2137V)	
	201	PIPA Temperature (GG2300T)		OG servo error (GG2187V)	
	*202	IRIG Temperature (GG2301T)		SCA GDB stepper switch	
	103	120 vdc Reference (GG1040V)		14. Insure that CH 3 AC indicator is lighted.	
	104	2.5 vdc PCM bias (GG1110V)		15. Set Phase Selector switch on demods to 3200 cps and zero oscillograph channels 1, 2, and 3. Following adjustments, set gains at 100 mv/mm. Set gain of channel 8 at 2 v/cm and zero adjust channel 8 for a centered trace with a 2.5 vdc bias input, by off-setting the zero line 12.5 mm to right of chart center line.	
	106	3200 cps 28 volt supply (GG1331V)		16. Press CHART SPEEDS 5 pushbutton on Oscillograph Control panel.	
	113	800 cps 28 volt supply (GG1201V)		17. Set switches on Signal Generator as follows:	
IG, MG, AND OG SERVO ERRORS				FUNCTION to SINE	
12. Perform following DSKY operations:				RANGE to X.1	
a. VERB 36	ENTR			FREQUENCY meter to 2.	
b. VERB 41	NOUN 20	ENTR		Set the OSS channel 5 to 1 DC. Use the DC balance control on the Signal Generator to center the trace about zero reference on the Oscillograph.	
c. Observe:					
VERB 21	NOUN 22	Flashing			
d. +00000	ENTR				
e. Observe:					
VERB 22	NOUN 23	Flashing			
f. +00000	ENTR				
g. Observe:					
VERB 23	NOUN 23	Flashing			
h. +00000	ENTR				

\*Not applicable to LEM Operational SCA, P/N 6007013-011.

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SUBSYSTEM LEM G &amp; N SYSTEM

ASSY

18. Perform following DSKY operations:
- a. VERB 42 ENTR
- b. VERB 33 ENTR
19. Set CHART DRIVE switch on Oscillograph Control panel to MM/SEC.
20. Press Gimbal Servo Test pushbutton on Test Selector panel. The pushbutton shall light.

Table II			
Test	Gimbal Servo Test Switch Position	Test Selector Panel Position	Signal
a	1	137	IG servo error
b	2	138	MG servo error
c	3	139	OG servo error

- \*IG, MG, AND OG TORQUE MOTOR CURRENTS (GG2110C, 2140C, and 2170C)

\*24. Insure that AMPLITUDE control on Signal Generator is set to 0.

\*25. Connect jumper between PROBES OUTPUT DIRECT jacks and CH 6 DC IN jacks on Auxiliary Input panel.

\*26. Set OSCILLOGRAPH SELECTOR CHANNEL 6 switch on Oscillograph Signal Selector panel to AUX.

\*27. Insure that CH 6 DC indicator is lighted.

\*28. Zero oscillograph channel 6 and set gain at 0.2 v/cm. Set gain of channel 8 at 2 v/cm and zero adjust channel 8 for a centered trace with a 2.5 vdc bias input by off-setting zero line 12.5 mm to right of chart center line.

\*29. Set FREQUENCY meter on Signal Generator to 5 and RANGE switch to X10.

\*30. Set CHART DRIVE switch on Oscillograph Control panel to MM/SEC.

21. Obtain an oscillograph trace of stabilization loop servo error data by performing the following steps for each test listed in table II.
- a. Press TEST START pushbutton on the Test Selector panel. The pushbutton shall light.
- b. Increase the Signal Generator amplitude to three-fourth of maximum for approximately 10 seconds, then return the control to 0.
- c. Press TEST STOP pushbutton on Test Selector panel; the TEST START pushbutton shall extinguish.

22. Press the Gimbal Servo Test pushbutton on the Test Selector panel. The pushbutton shall extinguish.

23. Following completion of tests, set Chart Drive switch on Oscillograph Control panel to cm/hr. Record peak-to-peak SCA input voltages monitored on channels 1, 2, and 3, and correlating peak-to-peak SCA output voltages monitored on channel 8.

\*Not applicable to LEM Operational SCA, P/N 6007013-011.

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## LEM SIGNAL CONDITIONER

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SUBSYSTEM LEM G &amp; N SYSTEM

ASSY

- \*31. Set CROSSBAR CONTROL switches on Primary Signal Selector panel to 176 to monitor Signal Generator output on oscilloscope.
- \*32. Press the Gimbal Servo Test pushbutton. The pushbutton shall light.
- \*33. Obtain oscillograph trace of torque motor currents by performing the following steps for each test listed in table III.

\*IG, MG, AND OG CDU FINE ERRORS (GG2220, 2250 and 2280)

\*36. Perform following DSKY operations:

- a. VERB 41 NOUN 20 ENTR
- b. Observe: VERB 21 NOUN 22 Flashing ENTR
- c. +00000
- d. Observe: VERB 22 NOUN 22 Flashing
- e. +00000
- f. Observe: VERB 23 NOUN 23 Flashing
- g. +00000

\*37. Connect jumper between PROBES OUTPUT BUFFERED jacks and PAVM IN jacks on Auxiliary Input panel.

\*38. Perform following DSKY operations:

a. VERB 21 NOUN 01 ENTR

b. 00370 ENTR

c. 19002 ENTR

d. VERB 57 ENTR

e. 00003 ENTR

f. Observe: VERB 06 NOUN 61 Flashing

g. VERB 21 ENTR

h. +00000 ENTR

i. VERB 22 ENTR

j. SITE LATITUDE VALUE from Table IV

k. VERB 33 ENTR

l. 00004 ENTR

m. 00001 ENTR

\*Not applicable to LEM Operational SCA, P/N 6007013-011.

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## LEM SIGNAL CONDITIONER

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SUBSYSTEM LEM G &amp; N SYSTEM

ASSY

Table III			
Test	PSA TPA Test Points	GIMBAL SERVO TEST Switch Position	Signal
a	2V peak-to-peak TB2-31 TB1-49	132	1 IG torque motor curr.
b	1V peak-to-peak TB2-32 TB1-49	133	2 MG torque motor curr.
c	1V peak-to-peak TB1-45 TB1-49	134	3 OG torque motor curr.

\*IG, MG, AND OG TORQUE MOTOR CURRENTS (GG2110C, 2140C, and 2170C)

\*24. Insure that AMPLITUDE control on Signal Generator is set to 0.

\*25. Connect jumper between PROBES OUTPUT DIRECT jacks and CH 6 DC IN jacks on Auxiliary Input panel.

\*26. Set OSCILLOGRAPH SELECTOR CHANNEL 6 switch on Oscillograph Signal Selector panel to AUX.

\*27. Insure that CH 6 DC indicator is lighted.

\*28. Zero oscillograph channel 6 and set gain at 0.2 v/cm. Set gain of channel 8 at 2 v/cm and zero adjust channel 8 for a centered trace with a 2.5 vdc bias input by off-setting zero line 12.5 mm to right of chart center line.

\*29. Set FREQUENCY meter on Signal Generator to 5 and RANGE switch to X10.

\*30. Set CHART DRIVE switch on Oscillograph Control panel to MM/SEC.

\*Not applicable to LEM Operational SCA, P/N 6007013-011.

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## LEM SIGNAL CONDITIONER

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SUBSYSTEM LEM G &amp; N SYSTEM

ASSY

Table IV			
Test	Signal Generator Output On Oscilloscope	Latitude	Longitude
a	MIT	+42.366	+39.921
b	ACSP	+42.902	+40.748
c	GAEC	+40.748	+29.556
d	MSC	+29.556	+28.516
e	KSC	+28.516	+39.921
f	NAA	+39.921	+42.366

n. Observe: VERB 21 NOUN 22 Flashing

o. +00100 ENTR

p. Observe: VERB 21 NOUN 22 Flashing

q. +00100 ENTR

r. Observe: VERB 23 NOUN 22 Flashing

s. +00100 ENTR

\*40. Monitor and record contents of  $R_1$ ,  $R_2$  and  $R_3$  on DSKY.

\*41. In approximately 120 seconds, monitor and record the contents of  $R_1$ ,  $R_2$  and  $R_3$  again.

41A. Set Test Selector panel to position 145 and CROSSBAR CONTROL to 271. Record the R & D 2.5 VDC Bias indicated on the DVM.

\*42. Connect SCA input to PAVM and SCA output to DVM by connecting PSA TPA buffered probes to test points listed in table IV and setting Test Selector panel to positions indicated. Record SCA in-phase input voltage on PAVM and SCA output voltage on DVM SIMULTANEOUSLY for each test.

NOTE: Due to earth rate, the voltages recorded in Table V will vary.

\*39. Within 10 to 90 seconds following step 38, a, perform the following DSKY operations:

a. VERB 21 NOUN 01 ENTR

b. 02512 ENTR

c. 00000 ENTR

d. VERB 16 NOUN 20 ENTR

\*Not applicable to LEM Operational SCA, P/N 6007013-011.

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## LEM SIGNAL CONDITIONER

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SUBSYSTEM LEM G &amp; N SYSTEM

ASSY

Table V			
Test	PSA TPA Test Points	Test Selector Panel Position	Signal
a	2V peak-to-peak TB2-31 TB1-49	132	1 IG torque motor curr.
b	1V peak-to-peak TB2-32 TB1-49	133	2 MG torque motor curr.
c	1V peak-to-peak TB1-45 TB1-49	134	3 OG torque motor curr.

\*43. Perform the following DSKY operations:

a. VERB 21 NOUN 01 ENTR

b. 02512 ENTR

c. 77776 ENTR

\*IG, MG, AND OG IX RESOLVER SIN  $\pm 10$  DEGREES (GG2121, 2151, and 2181)

\*44. Perform following DSKY operations:

a. VERB 41 NOUN 20 ENTR

b. Observe: VERB 21 NOUN 22 Flashing

c. +01000 ENTR

d. Observe: VERB 22 NOUN 22 Flashing

e. +01000 ENTR

f. Observe: VERB 23 NOUN 22 Flashing

g. +01000 ENTR

\*45. On DSKY, enter V16 N20 ENTR and verify that contents of  $R_1$ ,  $R_2$ , and  $R_3$  are approximately 01000.

\*46. Alternately connect SCA input and SCA output to DVM by setting Test Selector panel and CROSSBAR CONTROL switches to positions listed in table VI. For each test, perform following operations:

a. Set CROSSBAR CONTROL switches to 271.

b. Set Test Selector panel to position listed and record DVM indication.

c. Set CROSSBAR CONTROL switches to position listed and record DVM indication.

\*47. Perform following DSKY operations:

a. VERB 41 NOUN 20 ENTR

b. Observe: VERB 21 NOUN 22 Flashing

c. +04500 ENTR

d. Observe: VERB 22 NOUN 22 Flashing

e. +04500 ENTR

\*48. Perform following DSKY operations:

a. VERB 41 NOUN 20 ENTR

b. Observe: VERB 21 NOUN 22 Flashing

c. +04500 ENTR

d. Observe: VERB 22 NOUN 22 Flashing

e. +04500 ENTR

\*49. Perform following DSKY operations:

a. VERB 41 NOUN 20 ENTR

b. Observe: VERB 21 NOUN 22 Flashing

c. +04500 ENTR

d. Observe: VERB 22 NOUN 22 Flashing

e. +04500 ENTR

\*50. Perform following DSKY operations:

a. VERB 41 NOUN 20 ENTR

b. Observe: VERB 21 NOUN 22 Flashing

c. +04500 ENTR

d. Observe: VERB 22 NOUN 22 Flashing

e. +04500 ENTR

\*Not applicable to LEM Operational SCA, P/N 6007013-011.

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SUBSYSTEM LEM G & N SYSTEM		ASSY
f. Observe:		
VERB 23	NOUN 22	Flashing
g. +04500		ENTR
h. VERB 16	NOUN 20	ENTR
48. Monitor and record the contents of R <sub>1</sub> , R <sub>2</sub> , and R <sub>3</sub> .		
49. Alternately connect SCA output and SCA input to DVM for each test listed in table VII. For each test, perform following operations:		
a. Set CROSSEBAR CONTROL switches to 271.		
b. Set Test Selector panel to position listed and record DVM indication.		
c. Immediately set CROSSEBAR CONTROL switches on Primary Signal Selector panel to position listed and record DVM indication.		

Table VII			
Test	CROSSEBAR CONTROL Position	Test Selector Panel Position	Signal
a	243	120	IG IX resolver cos (GG2113V)
b	242	121	MG IX resolver cos (GG2143V)
c	241	122	OG IX resolver cos (GG2173V)
d	144	123	IG IX resolver sin (GG2112V)
e	143	124	MG IX resolver sin (GG2142V)
f	142	125	OG IX resolver sin (GG2172V)

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LEM SIGNAL CONDITIONER

JOB FUNCTIONAL CHECKOUT

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SUBSYSTEM LEM G & N SYSTEM		ASSY
d. Observe:		
VERB 22	NOUN 22	Flashing
e. +31500		ENTR
f. Observe:		
VERB 23	NOUN 22	Flashing
g. +31500		ENTR
h. VERB 16	NOUN 20	ENTR
57. Monitor and record the contents of R <sub>1</sub> , R <sub>2</sub> , and R <sub>3</sub> .		
58. Repeat step 49.		
59. Perform following DSKY operations:		
a. VERB 41	NOUN 20	ENTR
b. Observe:		
VERB 21	NOUN 22	Flashing
c. +00000		ENTR
d. Observe:		
VERB 22	NOUN 22	Flashing
e. +31500		ENTR
f. Observe:		
VERB 23	NOUN 22	Flashing
g. +31500		ENTR
*RR SHAFT AND TRUNNION FINE ERROR (GG3311V and 3321V)		
60. Resolver Circuit Tester Preparation (RCT)		
a. Set all decade error bridge switches and controls to OFF, minimum or zero.		
b. Connect cable W172 to GSE distribution box (GDB).		
c. Connect RCT power cable to facility 115 vac power.		
*Not applicable to LEM Operational SCA, P/N 6007013-011.		

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SUBSYSTEM LEM G & N SYSTEM		ASSY
*65. Perform following DSKY operations:		
a. VERB 40	NOUN 40	ENTR
b. VERB 21	NOUN 10	ENTR
c. 00012		ENTR
d. 00011		ENTR
*66. Monitor SCA input on PAVM by connecting PSA TPA buffered probe to TB3-33 (hi) and TB3-34 (lo) and connecting a jumper between PROBES OUTPUT BUFFERED jacks and PAVM IN jacks on Auxiliary input panel. Set PAVM Crossover Control switch on Primary Signal Selector panel to AUX.		
*67. Adjust RESOLVER ANGLE TRANS-MITTER control to produce a minimum total voltage signal on PAVM. Record DVM indication.		
*68. Adjust RESOLVER ANGLE TRANS-MITTER control until the in-phase voltage on the PAVM is +720 mv. Record the DVM indication.		
*69. Press TRUN SELECT/SET ENABLE pushbutton. Both halves of pushbutton will light.		
*70. Connect trunnion CDU fine error output from SCA to DVM by setting Test Selector panel to 147.		
*71. Remove PSA TPA buffered probe from TB3-33 (hi) and connect to TB3-30 (hi).		
*72. Adjust RESOLVER ANGLE TRANS-MITTER control until in-phase voltage on the PAVM is +720 mv. Record the DVM indication.		
*61. Set RESOLVER ANGLE TRANS-MITTER control to 0.		
*62. Press READ MODE/SET MODE pushbutton to light SET MODE indicator.		
*63. Press SHAFT SELECT/SET ENABLE pushbutton. Both halves of pushbutton will light.		
*64. Connect shaft CDU fine error output from SCA to DVM by setting Test Selector panel to 146.		
NOTE: G/N CAUTION lamp on the Monitor Panel and PROG alarm lamp on the DSKY will light during performance of steps 64 through 73. Ignore the lamp indications.		

\*Not applicable to LEM Operational SCA, P/N 6007013-011.

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LEM SIGNAL CONDITIONER

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SUBSYSTEM LEM G & N SYSTEM		ASSY
*73. Adjust RESOLVER ANGLE TRANS-MITTER control until PAVM indicates minimum total voltage signal. Record DVM indication.		
*74. Perform following DSKY operations:		
a. VERB 21	NOUN 10	ENTR
b. 00012		ENTR
c. 00010		ENTR
RR SHAFT AND TRUNNION IX RESOLVER SIN AND COS		
75. Perform following DSKY operation:		
VERB 36		ENTR
76. Set the following switches on the DEB and RCT control panel:		
a. DEB - reference quadrant to 0° - 90°.		
b. DEB - sensitivity to fully CCW.		
c. RCT - perform step 80g.		
d. RCT - set mode to lighted.		
e. DEB - degrees to 45,000.		
f. RCT - MON COARSE to lighted.		
g. RCT - resolver angle transmitter to 45,000.		
h. DEB/RCT - adjust transmitter and sensitivity dial to achieve best null on most sensitive coarse scale.		
i. DEB - set sensitivity to fully CCW.		
j. RCT - MON FINE to lighted.		
k. DEB - degrees to 0 + 00000.		
l. DEB/RCT - adjust transmitter and sensitivity to achieve best null and most sensitive fine scale.		
m. DEB - sensitivity to fully CCW.		
n. RCT - remove switch setting from step c.		
*Not applicable to LEM Operational SCA, P/N 6007013-011.		

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JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ ACC
B. 49. b (cont)	MG 1X Resolver (45°) Cos (Test B) (XBR 242)	VAC				
B. 49. c	OG 1X Resolver (45°) Cos (Test C) (TES 122)	VDC				
B. 49. d	OG 1X Resolver (45°) Cos (Test C) (XBR 241)	VAC				
B. 49. d	IG 1X Resolver (45°) Sin (Test D) (TES 122)	VDC				
B. 49. e	IG 1X Resolver (45°) Sin (Test D) (XBR 144)	VAC				
B. 49. e	MG 1X Resolver (45°) Sin (Test E) (TES 124)	VDC				
B. 49. f	MG 1X Resolver (45°) Sin (Test E) (XBR 143)	VAC				
B. 49. f	OG 1X Resolver (45°) Sin (Test F) (TES 125)	VDC				

\*Parameters not available in LEM Operational SCA,  
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JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ ACC
B. 49. f (cont)	OG 1X Resolver (45°) Sin (Test F) (XBR 142)	VAC				
B. 51	DSKY Row 1 DSKY Row 2 DSKY Row 3	Deg. Deg. Deg.				
B. 52. a	IG 1X Resolver (135°) Cos (Test A) (TES 120)	VDC				
B. 52. b	IG 1X Resolver (135°) Cos (Test A) (XBR 243)	VAC				
B. 52. b	MG 1X Resolver (135°) Cos (Test B) (TES 121)	VDC				
B. 52. c	MG 1X Resolver (135°) Cos (Test B) (XBR 242)	VAC				
B. 52. c	OG 1X Resolver (135°) Cos (Test C) (TES 122)	VDC				
B. 52. c	OG 1X Resolver (135°) Cos (Test C) (XBR 241)	VAC				

\*Parameters not available in LEM Operational SCA,  
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JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ ACC
B. 52. d	IG 1X Resolver (135°) Sin (Test D) (TES 123)	VDC				
B. 52. e	IG 1X Resolver (135°) Sin (Test D) (XBR 144)	VAC				
B. 52. e	MG 1X Resolver (135°) Sin (Test E) (TES 124)	VDC				
B. 52. f	MG 1X Resolver (135°) Sin (Test E) (XBR 143)	VAC				
B. 52. f	OG 1X Resolver (135°) Sin (Test F) (TES 125)	VDC				
B. 54	OG 1X Resolver (135°) Sin (Test F) (XBR 142)	VAC				
B. 54	DSKY Row 1 DSKY Row 2 DSKY Row 3	Deg. Deg. Deg.				
B. 55. a	IG 1X Resolver (225°) Cos (Test A) (TES 120)	VDC				

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JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ ACC
B. 55. a (cont)	IG 1X Resolver (225°) Cos (Test A) (XBR 245)	VAC				
B. 55. b	MG 1X Resolver (225°) Cos (Test B) (TES 121)	VDC				
B. 55. c	MG 1X Resolver (225°) Cos (Test B) (XBR 242)	VAC				
B. 55. c	OG 1X Resolver (225°) Cos (Test C) (TES 122)	VDC				
B. 55. d	OG 1X Resolver (225°) Cos (Test C) (XBR 241)	VAC				
B. 55. d	IG 1X Resolver (225°) Sin (Test D) (TES 123)	VDC				
B. 55. e	IG 1X Resolver (225°) Sin (Test D) (XBR 144)	VAC				
B. 55. e	MG 1X Resolver (225°) Sin (Test E) (TES 124)	VDC				

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JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ/ACC
B. 55.e (cont)	MG 1X Resolver (225°) Sin (Test E) (XBR 143)	VAC				
B. 55.f	OG 1X Resolver (225°) Sin (Test F) (TES 125)	VDC				
	OG 1X Resolver (225°) Sin (Test F) (XBR 142)	VAC				
B. 57	DSKY Row 1 DSKY Row 2 DSKY Row 3					
B. 58.a	IG 1X Resolver (315°) Cos (Test A) (TES 120)	VDC				
	IG 1X Resolver (315°) Cos (Test A) (XBR 243)	VAC				
B. 58.b	MG 1X Resolver (315°) Cos (Test B) (TES 121)	VDC				
	MG 1X Resolver (315°) Cos (Test B) (XBR 242)	VAC				

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JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ/ACC
B. 58.c	OG 1X Resolver (315°) Cos (Test C) (TES 122)	VDC				
	OG 1X Resolver (315°) (Test C) (XBR 241)	VAC				
B. 58.d	IG 1X Resolver (315°) Sin (Test D) (TES 123)	VDC				
	IG 1X Resolver (315°) Sin (Test D) (XBR 144)	VAC				
B. 58.e	MG 1X Resolver (315°) Sin (Test E) (TES 124)	VDC				
	MG 1X Resolver (315°) Sin (Test E) (XBR 143)	VAC				
B. 58.f	OG 1X Resolver (315°) Sin (Test F) (TES 125)	VDC				
	OG 1X Resolver (315°) Sin (Test F) (XBR 142)	VAC				
B. 57	*Shaft CDU Fine Error	VDC	2.45		2.55	

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JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ/ACC
B. 68	*Shaft CDU Fine Error	VDC	3.75		4.25	
B. 72	*Trunnion CDU Fine Error	VDC	3.75		4.25	
B. 73	*Trunnion CDU Fine Error	VDC	2.45		2.55	
B. 79	Trunnion 1X Resolver Sin (TES 128)	VDC	4.45		4.95	
	Trunnion 1X Resolver Cos (TES 131)	VDC	4.45		4.95	
B. 82	Shaft 1X Resolver Sin (TES 129)	VDC	4.45		4.95	
	Shaft 1X Resolver Cos (TES 130)	VDC	4.45		4.95	
B. 88.a	Yaw Attitude Error (PAVM)	VAC				
	Yaw Attitude Error (DVM) (TES 114)	VDC				
B. 89.b	Pitch Attitude Error (PAVM)	VAC				

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JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ/ACC
B. 89.b (cont)	Pitch Attitude Error (DVM) (TES 115)	VDC				
B. 89.c	Roll Attitude Error (PAVM) Roll Attitude Error (DVM) (TES 116)	VAC				
CALCULATIONS						
C. 1	$\text{*IG CDU fine error} = \frac{\text{SCA output (VDC)} - 2.5V \text{ R\&D bias}}{2.00 \times \text{SCA input (VAC)}} = 1 (\pm 0\%)$ $\text{*MG CDU fine error} = \frac{\text{SCA output (VDC)} - 2.5V \text{ R\&D bias}}{2.00 \times \text{SCA input (VAC)}} = 1 (\pm 0\%)$ $\text{*OG CDU fine error} = \frac{\text{SCA output (VDC)} - 2.5V \text{ R\&D bias}}{2.00 \times \text{SCA input (PAVM)}} = 1 (\pm 0\%)$					
C. 2	$\text{*OG 1X resolver sin } \pm 10^\circ = \frac{2 (\text{SCA output (VDC)} - 2.5V \text{ PCM bias})}{\text{SCA input (VAC)}} = 1 (\pm 10\%)$					

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CALCULATIONS	REJ	ACC
C.2 (cont)		
*MG 1X resolver sin $\pm 10^\circ = \frac{2 \text{ (SCA output (VDC) -2.5V PCM bias)}}{\text{SCA input (VAC)}}$ = 1 ( $\pm 10\%$ )		
*IG 1X resolver sin $\pm 10^\circ = \frac{2 \text{ (SCA output (VDC) -2.5V PCM bias)}}{\text{SCA input (VAC)}}$ = 1 ( $\pm 10\%$ )		
C.3		
IG 1X resolver cos ( $45^\circ$ ) = $\frac{8.5 \text{ (SCA output (VDC)(B.49.a) -2.5V PCM bias)}}{\text{SCA input (VAC) (B.49.a)}}$ = 1 ( $\pm 10\%$ )		
MG 1X resolver cos ( $45^\circ$ ) = $\frac{8.5 \text{ (SCA output (VDC)(B.49.b) -2.5V PCM bias)}}{\text{SCA input (VAC) (B.49.b)}}$ = 1 ( $\pm 10\%$ )		
OG 1X resolver cos ( $45^\circ$ ) = $\frac{8.5 \text{ (SCA output (VDC)(B.49.c) -2.5V PCM bias)}}{\text{SCA input (VAC) (B.49.c)}}$ = 1 ( $\pm 10\%$ )		

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CALCULATIONS	REJ	ACC
C.3 (cont)		
IG 1X resolver sin ( $45^\circ$ ) = $\frac{8.5 \text{ (SCA output (VDC)(B.49.d) -2.5V PCM bias)}}{\text{SCA input (VAC) (B.49.d)}}$ = 1 ( $\pm 10\%$ )		
MG 1X resolver sin ( $45^\circ$ ) = $\frac{8.5 \text{ (SCA output (VDC)(B.49.e) -2.5V PCM bias)}}{\text{SCA input (VAC) (B.49.e)}}$ = 1 ( $\pm 10\%$ )		
OG 1X resolver sin ( $45^\circ$ ) = $\frac{8.5 \text{ (SCA output (VDC)(B.49.f) -2.5V PCM bias)}}{\text{SCA input (VAC) (B.49.f)}}$ = 1 ( $\pm 10\%$ )		
IG 1X resolver cos ( $135^\circ$ ) = $\frac{8.5 \text{ (SCA output (VDC)(B.52.a) -2.5V PCM bias)}}{\text{SCA input (VAC) (B.52.a)}}$ = 1 ( $\pm 10\%$ )		
MG 1X resolver cos ( $135^\circ$ ) = $\frac{8.5 \text{ (SCA output (VDC)(B.52.b) -2.5V PCM bias)}}{\text{SCA input (VAC) (B.52.b)}}$ = 1 ( $\pm 10\%$ )		

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CALCULATIONS	REJ	ACC
C.3. (cont)		
OG 1X resolver cos ( $135^\circ$ ) = $\frac{8.5 \text{ (SCA output (VDC)(B.52.c) -2.5V PCM bias)}}{\text{SCA input (VAC) (B.52.c)}}$ = 1 ( $\pm 10\%$ )		
IG 1X resolver sin ( $135^\circ$ ) = $\frac{8.5 \text{ (SCA output (VDC)(B.52.d) -2.5V PCM bias)}}{\text{SCA input (VAC) (B.52.d)}}$ = 1 ( $\pm 10\%$ )		
MG 1X resolver sin ( $135^\circ$ ) = $\frac{8.5 \text{ (SCA output (VDC)(B.52.e) -2.5V PCM bias)}}{\text{SCA input (VAC) (B.52.e)}}$ = 1 ( $\pm 10\%$ )		
OG 1X resolver sin ( $135^\circ$ ) = $\frac{8.5 \text{ (SCA output (VDC)(B.52.f) -2.5V PCM bias)}}{\text{SCA input (VAC) (B.52.f)}}$ = 1 ( $\pm 10\%$ )		
IG 1X resolver cos ( $225^\circ$ ) = $\frac{8.5 \text{ (SCA output (VDC)(B.55.a) -2.5V PCM bias)}}{\text{SCA input (VAC) (B.55.a)}}$ = -1 ( $\pm 10\%$ )		
MG 1X resolver cos ( $225^\circ$ ) = $\frac{8.5 \text{ (SCA output (VDC)(B.55.b) -2.5V PCM bias)}}{\text{SCA input (VAC) (B.55.b)}}$ = -1 ( $\pm 10\%$ )		

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CALCULATIONS	REJ	ACC
C.3 (cont)		
OG 1X resolver cos ( $225^\circ$ ) = $\frac{8.5 \text{ (SCA output (VDC)(B.55.c) -2.5V PCM bias)}}{\text{SCA input (VAC) (B.55.c)}}$ = -1 ( $\pm 10\%$ )		
IG 1X resolver sin ( $225^\circ$ ) = $\frac{8.5 \text{ (SCA output (VDC)(B.55.d) -2.5V PCM bias)}}{\text{SCA input (VAC) (B.55.d)}}$ = 1 ( $\pm 10\%$ )		
MG 1X resolver sin ( $225^\circ$ ) = $\frac{8.5 \text{ (SCA output (VDC)(B.55.e) -2.5V PCM bias)}}{\text{SCA input (VAC) (B.55.e)}}$ = 1 ( $\pm 10\%$ )		
OG 1X resolver sin ( $225^\circ$ ) = $\frac{8.5 \text{ (SCA output (VDC)(B.55.f) -2.5V PCM bias)}}{\text{SCA input (VAC) (B.55.f)}}$ = 1 ( $\pm 10\%$ )		
IG 1X resolver cos ( $315^\circ$ ) = $\frac{8.5 \text{ (SCA output (VDC)(B.58.a) -2.5V PCM bias)}}{\text{SCA input (VAC) (B.58.a)}}$ = 1 ( $\pm 10\%$ )		
MG 1X resolver cos ( $315^\circ$ ) = $\frac{8.5 \text{ (SCA output (VDC)(B.58.b) -2.5V PCM bias)}}{\text{SCA input (VAC) (B.58.b)}}$ = 1 ( $\pm 10\%$ )		

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CALCULATIONS		REJ/ACC
C. 3 (cont)		
OG IX resolver cos (315°) = $\frac{8.5 \text{ (SCA output (VDC) (B. 58. c) - 2.5V PCM bias)}}{\text{SCA input (VAC) (B. 58. c)}}$ = 1 (±10%)		
IG IX resolver sin (315°) = $\frac{8.5 \text{ (SCA output (VDC) (B. 58. d) - 2.5V PCM bias)}}{\text{SCA input (VAC) (B. 58. d)}}$ = -1 (±10%)		
MG IX resolver sin (315°) = $\frac{8.5 \text{ (SCA output (VDC) (B. 58. e) - 2.5V PCM bias)}}{\text{SCA input (VAC) (B. 58. e)}}$ = -1 (±10%)		
OG IX resolver sin (315°) = $\frac{8.5 \text{ (SCA output (VDC) (B. 58. f) - 2.5V PCM bias)}}{\text{SCA input (VAC) (B. 58. f)}}$ = -1 (±10%)		
C. 4		
Yaw attitude error = $\frac{2.44 \text{ (SCA output (VDC) (B. 89. a) - 2.5V PCM bias)}}{\text{SCA input (VAC) (B. 89. a)}}$ = 1 (±10%)		

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CALCULATIONS		REJ	ACC
C. 4 (cont)	$\text{Pitch attitude error} = \frac{2.44 \text{ (SCA output (VDC) (B. 89. b) - 2.5V PCM bias)}}{\text{SCA input (VAC) (B. 89. b)}}$ $= 1 (\pm 10\%)$		
	$\text{Roll attitude error} = \frac{2.44 \text{ (SCA output (VDC) (B. 89. c) - 2.5V PCM bias)}}{\text{SCA input (VAC) (B. 89. c)}}$ $= 1 (\pm 10\%)$		

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SUBSYSTEM LEM G & N SYSTEM				ASSY	
DESCRIPTION: This JDC provides a functional checkout procedure for the Signal Conditioner Module. Functional operation is evaluated by checking Signal Conditioner Module input and output data for proper correlation. Procedural methods are incorporated to cause signal generation in normally muted loops where possible in a G and N test configuration for maximum checkout capability.					
Rev. Let.	Date	NO.	JDC	APPROVAL	REFERENCES
A	8-24-67	34479	ALL	MIT NASA	PS 6015000
B	8-31-67	34478	1, 2, 4-8, 10, 11-3, 12, 11, 13, 14	EA 40	JDC 12614
C	10-10-67	34802	12	EA 40	IMPORTANT
					See below
					INTERVAL
					TOOLS AND MATERIAL

**IMPORTANT:** Step numbers preceded by an asterisk are not to be performed when testing with LEM Operational SCA, P/N 6007010-011. Perform all steps when testing with LEM Flight Qualification SCA, P/N 6007010-011.

**A. PREPARATION**

NOTE: If SCA has been previously installed in system configuration prior to the performance of this JDC, proceed with step A.7. If installation is required, proceed with step A.1.

- Perform, if applicable, JDC 12614 to downmode to OIA on mode.
- Remove the DSKY Mounting Pedestal and DSKY from the Component Mounting Plate following detachment of ground strap and denating of cable W143 to DSKY.

VERIFICATION WITH SDA REQUIRED BEFORE USE

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SUBSYSTEM LEM G & N SYSTEM				ASSY	
7. Perform JDC 12614 to place the G and N system in ISS STANDBY mode with the LCC operating.				b. Press PUSH TO ADVANCE pushbutton until display indicates last two digits.	
8. Connect PSA Test Point Adapter (TPA #2) direct probes to TBI-29 (h) and TBS-22 (lo).				2. Set Test Selector panel to positions indicated and measure and record the following voltages on DVM.	
9. Connect jumper between PROBES OUTPUT DIRECT jacks and DVM IN jacks on Auxiliary Input Panel.				Test Selector Panel Position	Voltage
NOTE: The 28 VDC G & N Power adjusted in the following step will vary as result of heater cycling.				101	28 vdc LCC operate (GG1523X)
10. On Primary Signal Selector panel, set CROSSEBAR CONTROL switches to 120 and adjust G & N Power Adjust control on Test Control panel until DVM indicates 28 (+0.25) vdc. Record DVM indication.				102	28 vdc IMU standby (GG1513X)
B. PROCEDURE				PIPA S/G OUTPUT	
28 VDC STANDBY AND LCC OPERATE				3. Connect following signals to oscillograph by setting switches on Oscillograph Signal Selector panel to positions indicated:	
1. Connect SCA GSE Distribution Box (GDB) stepper switch to DVM by setting CROSSEBAR CONTROL switches on Primary Signal Selector panel to 271.				Switch	Signal
NOTE: To position Test Selector panel, perform following operations:				CHANNEL 4 to 1	Z PIPA S/G output (GG2041V)
a. Press SIGNAL CONTROLLER LEVEL 1				CHANNEL 5 to 1	Y PIPA S/G output (GG2021V)
ENABLE pushbutton if first digit on Test Selector panel position is 1, or press SIGNAL CONDITIONER LEVEL 2 ENABLE pushbutton if first digit is 2.				CHANNEL 6 to 1	X PIPA S/G output (GG2001V)
				CHANNEL 8 to 4	SCA GDB stepper switch
				4. Insure that CH AC indicators are lighted for channels 4, 5, and 6.	
				5. Set Phase Selector switch on demods to variable and zero oscillograph channels 4, 5, and 6. Set gains at 500 mv/mm following adjustments.	
				6. Set gain of oscillograph channel 8 at 2 v/cm and zero adjust channel 8 for a centered trace with a 2.5 vdc bias input by	

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SUBSYSTEM LEM G & N SYSTEM				ASSY	
off-setting zero line 12.5 mm to right of center line.					
7. Insure that PROCEED Indicator of PROCEED/ISS OPERATE pushbutton on Test Control panel is lighted and the STANDBY requirements of JDC 12614 have been satisfied.					
8. Press CHART SPEEDS 5 pushbutton on Oscillograph Control panel and set CHART DRIVE switch to cm/hr.					
9. Obtain oscillograph record of PIPA loop closure data by performing following steps successively for each position of Test Selector panel listed in table I:					
a. After a minimum of 5 minutes in ISS STANDBY mode, set CHART DRIVE switch on oscillograph control panel to MM/SEC and press PROCEED/ISS OPERATE pushbutton on Test Control panel.					
b. Wait at least 10 seconds following PIPA loop closure when in tests a and b, then press the PROCEED/ISS STANDBY pushbutton. Following test c, allow system to remain in ISS OPERATE mode.					
c. Following each test, set Chart Drive switch on oscillograph control panel to cm/hr. Check oscillograph recording for indications of PIPA loop closure on channel 8 correlating to the loop closure indications on channels 4, 5 and 6 respectively. Record that traces have centered after loop closure.					

Table I		
Test	Test Selector Panel Position	Signal
a	117	Z PIPA S/G in-phase output
b	118	Y PIPA S/G in-phase output
c	119	X PIPA S/G in-phase output

10. On the Primary Signal Selector panel, set the CROSSEBAR CONTROL switches to 173 and adjust the G and N Power Adjust control on the Test Control panel until the DVM indicates 28 (+0.25) vdc. Record DVM indication. Following measurement, return CROSSEBAR CONTROL switches to 271.

11. Set Test Selector panel to positions indicated and measure and record following voltages on DVM:

NOTE: The SCA Test Inhibit Indicator on the Temperature Monitor Control panel will illuminate when the Test Selector Crossbar is in positions 201 and 202. Following measurements in these positions, push Signal Conditioner Level 2 Enable pushbutton and verify that the above inhibit indicator extinguishes.

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SUBSYSTEM LEM G & N SYSTEM				ASSY	
13. Connect following signals to oscillograph by setting following switches on Oscillograph Signal Selector panel to positions indicated:				Switch	Signal
				CHANNEL 1 to 2	IG servo error (GG2107V)
				CHANNEL 2 to 2	MG servo error (GG2137V)
				CHANNEL 3 to 2	OG servo error (GG2167V)
				CHANNEL 8 to 4	SCA GDB stepper switch
				14. Insure that CH 3 AC Indicator is lighted.	
				15. Set Phase Selector switch on demods to 3200 cps and zero oscillograph channels 1, 2, and 3. Following adjustments, set gains at 100 mv/mm. Set gain of channel 8 at 2 v/cm and zero adjust channel 8 for a centered trace with a 2.5 vdc bias input, by off-setting the zero line 12.5 mm to right of chart center line.	
				16. Press CHART SPEEDS 5 pushbutton on Oscillograph Control panel.	
				17. Set switches on Signal Generator as follows:	
				FUNCTION to SINE	
				RANGE to X.1	
				FREQUENCY meter to 2.	
				Set the OSS channel 5 to 1 DC. Use the DC balance control on the Signal Generator to center the trace about zero reference on the Oscillograph.	

IG, MG, AND OG SERVO ERRORS

12. Perform following DSKY operations:

- VERB 36 ENTR
- VERB 41 NOUN 20 ENTR
- Observe: VERB 21 NOUN 22 Flashing +00000 ENTR
- Observe: VERB 22 NOUN 22 Flashing +00000 ENTR
- Observe: VERB 23 NOUN 22 Flashing +00000 ENTR

\*Not applicable to LEM Operational SCA, P/N 6007013-011.

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SUBSYSTEM LEM G & N SYSTEM

18. Perform following DSKY operations:  
a. VERB 42 ENTR  
b. VERB 33 ENTR  
19. Set CHART DRIVE switch on Oscillograph Control panel to MM/SEC.  
20. Press Gimbal Servo Test pushbutton on Test Selector panel. The pushbutton shall light.

21. Obtain an oscillograph trace of stabilization loop servo error data by performing the following steps for each test listed in table II.

- a. Press TEST START pushbutton on the Test Selector panel. The pushbutton shall light.

- b. Increase the Signal Generator amplitude to three-fourth of maximum for approximately 10 seconds, then return the control to 0.

- c. Press TEST STOP pushbutton on Test Selector panel; the TEST START pushbutton shall extinguish.

22. Press the Gimbal Servo Test pushbutton on the Test Selector panel. The pushbutton shall extinguish.

23. Following completion of tests, set Chart Drive switch on Oscillograph Control panel to cm/hr. Record peak-to-peak SCA input voltages monitored on channels 1, 2, and 3, and correlating peak-to-peak SCA output voltages monitored on channel 8.

Table II

Test	Gimbal Servo Test Switch Position	Test Selector Panel Position	Signal
a	1	137	IG servo error
b	2	138	MG servo error
c	3	139	OG servo error

\*IG, MG, AND OG TORQUE MOTOR CURRENTS (GG210C, 2140C, and 2170C)

\*24. Insure that AMPLITUDE control on Signal Generator is set to 0.

\*25. Connect jumper between PROBES OUTPUT DIRECT jacks and CH 6 DC IN jacks on Auxiliary Input panel.

\*26. Set OSCILLOGRAPH SELECTOR CHANNEL 6 switch on Oscillograph Signal Selector panel to AUX.

\*27. Insure that CH 6 DC Indicator is lighted.

\*28. Zero oscillograph channel 6 and set gain at 0.2 v/cm. Set gain of channel 8 at 2 v/cm and zero adjust channel 8 for a centered trace with a 2.5 vdc bias input by off-setting zero line 12.5 mm to right of chart center line.

\*29. Set FREQUENCY meter on Signal Generator to 5 and RANGE switch to X10.

\*30. Set CHART DRIVE switch on Oscillograph Control panel to MM/SEC.

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SUBSYSTEM LEM G & N SYSTEM

- \*31. Set CROSSBAR CONTROL switches on Primary Signal Selector panel to 176 to monitor Signal Generator output on oscilloscope.

- \*32. Press the Gimbal Servo Test pushbutton. The pushbutton shall light.  
\*33. Obtain oscillograph trace of torque motor currents by performing the following steps for each test listed in table III.

- a. Connect PSA TPA Test Points to direct probes.

- b. Set Test Selector Crossbar and Gimbal Servo Test switch as indicated.

- c. Press Test START pushbutton on Test Selector panel. The pushbutton shall light.

- d. Increase Signal Generator Amplitude Control until the oscilloscope indicates value listed in table III for each test. Maintain Signal Generator setting for approximately 10 seconds, then return control to 0.

- e. Press Test STOP pushbutton on the Test Selector panel. The pushbutton shall extinguish.

- \*34. Press the GIMBAL SERVO TEST pushbutton. The pushbutton shall extinguish. Set Oscillograph pre-amps to OFF.

- \*35. Set Chart Drive switch on Oscillograph Control panel to cm/hr. Record peak-to-peak SCA input signal monitored on channel 6 and peak-to-peak SCA output signal monitored on channel 8.

ASSY

\*IG, MG, AND OG CDU FINE ERRORS (GG2220, 2250 and 2280)

\*36. Perform following DSKY operations:  
a. VERB 41 NOUN 20 ENTR

b. Observe:  
VERB 21 NOUN 22 Flashing

c. +00000 ENTR

d. Observe:  
VERB 22 NOUN 22 Flashing

e. +00000

f. Observe:  
VERB 23 NOUN 23 Flashing

g. +00000

\*37. Connect jumper between PROBES OUTPUT BUFFERED jacks and PAVM IN jacks on Auxiliary Input panel.

\*38. Perform following DSKY operations:  
a. VERB 21 NOUN 01 ENTR

b. 00370 ENTR

c. 18002 ENTR

d. VERB 57 ENTR

e. 00003 ENTR

f. Observe:  
VERB 06 NOUN 61 Flashing

g. VERB 21 ENTR

h. +00000 ENTR

i. VERB 22 ENTR

j. SITE LATITUDE VALUE from Table IV

k. VERB 33 ENTR

l. 00004 ENTR

m. 00001 ENTR

\*Not applicable to LEM Operational SCA, P/N 6007013-011.

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SUBSYSTEM LEM G & N SYSTEM

ASSY

Table III

Test	Signal Generator Output On Oscilloscope	PSA TPA Test Points	Test Selector Panel Position	GIMBAL SERVO TEST Switch Position	Signal
a	2V peak-to-peak	TB2-31	TB1-49	1	IG torque motor curr.
b	1V peak-to-peak	TB2-32	TB1-49	2	MG torque motor curr.
c	1V peak-to-peak	TB1-45	TB1-49	3	OG torque motor curr.

- a. Observe:  
VERB 21 NOUN 22 Flashing

- o. +00100 ENTR

- p. Observe:  
VERB 21 NOUN 22 Flashing

- q. +00100 ENTR

- r. Observe:  
VERB 23 NOUN 22 Flashing

- s. +00100 ENTR

Table IV

Test Site	Latitude
MIT	+42.366
ACSP	+42.902
GAEC	+40.748
MSC	+29.556
KSC	+28.516
NAA	+33.921

- \*39. Within 10 to 90 seconds following step 38, perform the following DSKY operations:

- a. VERB 21 NOUN 01 ENTR

- b. 02512 ENTR

- c. 00000 ENTR

- d. VERB 16 NOUN 20 ENTR

- \*43. Perform the following DSKY operations:  
a. VERB 21 NOUN 01 ENTR

- b. 02512 ENTR

- c. 77776 ENTR

\*IG, MG, AND OG LX RESOLVER SIN  $\pm 10$  DEGREES (GG2121, 2151, and 2181)

- \*44. Perform following DSKY operations:  
a. VERB 41 NOUN 20 ENTR

- b. Observe:  
VERB 21 NOUN 22 Flashing

- c. +01000 ENTR

- d. Observe:  
VERB 22 NOUN 22 Flashing

- e. +01000 ENTR

- f. Observe:  
VERB 23 NOUN 22 Flashing

- g. +01000 ENTR

- \*45. On DSKY, enter V16 N20 ENTR and verify that contents of  $R_1$ ,  $R_2$ , and  $R_3$  are approximately 01000.

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SUBSYSTEM LEM G & N SYSTEM

ASSY

Table V

Test	PSA TPA Test Points	Test Selector Panel Position	Signal
a	TB3-37 TB3-34	140	IG CDU fine error
b	TB3-38 TB3-34	141	MG CDU fine error
c	TB3-41 TB3-34	142	OG CDU fine error

\*46. Alternately connect SCA input and SCA output to DVM by setting Test Selector panel and CROSSBAR CONTROL switches to positions listed in table VI. For each test, perform following operations:  
a. Set CROSSBAR CONTROL switches to 271.

b. Set Test Selector panel to position listed and record DVM indication.

c. Set CROSSBAR CONTROL switches to position listed and record DVM indication.

Table VI

Test	CROSSBAR Test CONTROL Panel Position	Signal
a	142	OG LX resolver sin $\pm 10^\circ$
b	144	IG LX resolver sin $\pm 10^\circ$
c	143	MG LX resolver sin $\pm 10^\circ$

IG, MG, AND OG LX RESOLVER SIN AND COS

\*47. Perform following DSKY operations:  
a. VERB 41 NOUN 20 ENTR

b. Observe:  
VERB 21 NOUN 22 Flashing

c. +04500 ENTR

d. Observe:  
VERB 22 NOUN 22 Flashing

e. +04500

\*Not applicable to LEM Operational SCA, P/N 6007013-011.

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\*Not applicable to LEM Operational SCA, P/N 6007013-011.

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SUBSYSTEM LEM G & N SYSTEM			ASSY
f. Observe:			50. Perform following DSKY operations:
VERB 23	NOUN 22	Flashing	a. VERB 41 NOUN 20 ENTR
g. +04500		ENTR	b. Observe:
h. VERB 16	NOUN 20	ENTR	VERB 21 NOUN 22 Flashing
48. Monitor and record the contents of R <sub>1</sub> , R <sub>2</sub> , and R <sub>3</sub> .			c. +13500
49. Alternately connect SCA output and SCA input to DVM for each test listed in table VII. For each test, perform following operations:			d. Observe:
a. Set CROSSBAR CONTROL switches to 271.			VERB 22 NOUN 22 Flashing
b. Set Test Selector panel to position listed and record DVM indication.			e. +13500
c. Immediately set CROSSBAR CONTROL switches on Primary Signal Selector panel to position listed and record DVM indication.			f. Observe:
			VERB 23 NOUN 22 Flashing
			g. +13500
			h. VERB 16 NOUN 20 ENTR
			51. Monitor and record the contents of R <sub>1</sub> , R <sub>2</sub> , and R <sub>3</sub> .
			52. Repeat step 49.
			53. Perform following DSKY operations:
			a. VERB 41 NOUN 20 ENTR
			b. Observe:
			VERB 21 NOUN 22 Flashing
			c. +22500
			d. Observe:
			VERB 22 NOUN 22 Flashing
			e. +22500
			f. Observe:
			VERB 23 NOUN 22 Flashing
			g. +22500
			h. VERB 16 NOUN 20 ENTR
			54. Monitor and record the contents of R <sub>1</sub> , R <sub>2</sub> , and R <sub>3</sub> .
			55. Repeat step 49.
			56. Perform following DSKY operations:
			a. VERB 41 NOUN 20 ENTR
			b. VERB 21 NOUN 22 Flashing
			c. +31500

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Test	CROSSBAR Test Position	Signal
a	243	IG IX resolver cos (GG2113V)
b	242	MG IX resolver cos (GG2143V)
c	241	OG IX resolver cos (GG2173V)
d	144	IG IX resolver sin (GG2112V)
e	143	MG IX resolver sin (GG2142V)
f	142	OG IX resolver sin (GG2172V)

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SUBSYSTEM LEM G & N SYSTEM			ASSY
d. Observe:			d. Connect jumper from decade error bridge (DEB) front panel output jacks to DEB front panel signal input jacks.
VERB 22	NOUN 22	Flashing	e. Turn 800 ~ reference input voltage switch on DEB from OFF to 26V. Power indicator shall light.
e. +31500		ENTR	f. Press the Resolver Circuit Tester Control Panel POWER ON pushbutton.
f. Observe:			POWER ON, READ MODE and MON COARSE or MON FINE indicators shall light.
VERB 23	NOUN 22	Flashing	g. Select one of 3 operating channels (IG, MG or OG select) and verify the two LORS switches (Read rate table input and LORS rate table control) are energized.
g. +31500		ENTR	h. Read Mode/Set Mode shall be placed in set mode position.
h. VERB 16	NOUN 20	ENTR	i. If MON COARSE indicator is not lit, press MON COARSE pushbutton. MON COARSE indicator shall light.
57. Monitor and record the contents of R <sub>1</sub> , R <sub>2</sub> , and R <sub>3</sub> .			j. Determine that reference quadrant vernier dial is set to 0°, and reference quadrant dial to 0° - 90° position.
58. Repeat step 49.			k. Determine that decade degrees dials are set to 0°.
59. Perform following DSKY operations:			l. Rotate resolver control and observe null meter. When null meter deflects right (+) while rotating resolver CW, the IX or coarse resolver is at one of its two nulls.
a. VERB 41 NOUN 20 ENTR			m. Press MON FINE pushbutton. MON FINE indicator lights. Rotate resolver control and observe null meter. When null meter deflects right (+) while ro-
b. Observe:			
VERB 21 NOUN 22 Flashing			
c. +00000			
d. Observe:			
VERB 22 NOUN 22 Flashing			
e. +31500			
f. Observe:			
VERB 23 NOUN 22 Flashing			
g. +31500			
*RR SHAFT AND TRUNNION FINE ERROR (GG3311V and 3321V)			
60. Resolver Circuit Tester Preparation (RCT)			
a. Set all decade error bridge switches and controls to OFF, minimum or zero.			
b. Connect cable W172 to GSE distribution box (GDB).			
c. Connect RCT power cable to facility 115 vac power.			

\*Not applicable to LEM Operational SCA, P/N 6007013-011.

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SUBSYSTEM LEM G & N SYSTEM			ASSY
*65. Perform following DSKY operations:			
a. VERB 40	NOUN 40	ENTR	
b. VERB 21	NOUN 10	ENTR	
c. 00012		ENTR	
d. 00011		ENTR	
*66. Monitor SCA input on PAVM by connecting PSA TPA buffered probe to TB3-33 (h) and TB3-34 (l) and connecting a jumper between PROBES OUTPUT BUFFERED jacks and PAVM IN jacks on Auxiliary Input panel.			
Set PAVM Crossbar Control switch on Primary Signal Selector panel to AUX.			
*67. Adjust RESOLVER ANGLE TRANS-MITTER control to produce a minimum total voltage signal on PAVM. Record DVM indication.			
*68. Adjust RESOLVER ANGLE TRANS-MITTER control until the in-phase voltage on the PAVM is +720 mv. Record the DVM indication.			
*69. Press TRUN SELECT/SET ENABLE pushbutton. Both halves of pushbutton will light.			
*70. Connect trunnion CDU fine error output from SCA to DVM by setting Test Selector panel to 147.			
*71. Remove PSA TPA buffered probe from TB3-33 (h) and connect to TB3-30 (l).			
*72. Adjust RESOLVER ANGLE TRANS-MITTER control until in-phase voltage on the PAVM is +720 mv. Record the DVM indication.			

\*Not applicable to LEM Operational SCA, P/N 6007013-011.

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SUBSYSTEM LEM G & N SYSTEM			ASSY
*73. Adjust RESOLVER ANGLE TRANS-MITTER control until PAVM indicates minimum total voltage signal. Record DVM indication.			
*74. Perform following DSKY operations:			
a. VERB 21	NOUN 10	ENTR	
b. 00012		ENTR	
c. 00010		ENTR	
RR SHAFT AND TRUNNION IX RESOLVER SIN AND COS			
75. Perform following DSKY operations:			
VERB 36		ENTR	
VERB 40	NOUN 40	ENTR	
76. Set the following switches on the DEB and RCT control panel:			
a. DEB - reference quadrant to 0° - 90°.			
b. DEB - sensitivity to fully CCW.			
c. RCT - perform step 60g.			
d. RCT - set mode to lighted.			
e. DEB - degrees to 45,000.			
f. RCT - MON COARSE to lighted.			
g. RCT - resolver angle transmitter to 45,000.			
h. DEB/RCT - adjust transmitter and sensitivity dial to achieve best null on most sensitive coarse scale.			
i. DEB - set sensitivity to fully CCW.			
j. RCT - MON FINE to lighted.			
k. DEB - degrees to 0 + 00,000.			
l. DEB/RCT - adjust transmitter and sensitivity to achieve best null and most sensitive fine scale.			
m. DEB - sensitivity to fully CCW.			
n. RCT - remove switch setting from step c.			

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83. Set RESOLVER ANGLE TRANSMITTER control to 0.
84. Set 800 REFERENCE INPUT VOLTAGE switch on Decade Error Bridge panel to OFF.
- YAW, PITCH, AND ROLL ATTITUDE ERRORS (GG2249V, 2219V and 2279V)
85. Perform following DSKY operations:
- a. VERB 41 NOUN 20 ENTR
- b. Observe:  
VERB 21 NOUN 22 Flashing  
ENTR
- c. +00000
- d. Observe:  
VERB 22 NOUN 22 Flashing  
ENTR
- e. +00000
- f. Observe:  
VERB 23 NOUN 22 Flashing  
ENTR
- g. +00000
86. Perform following DSKY operations:
- a. VERB 21 NOUN 10 ENTR
- b. 00012 ENTR
- c. 00060 ENTR
- NOTE: BS warning lamp on Monitor panel may light during step 86. Ignore lamp indication.
87. Perform following DSKY operations:
- a. VERB 43 ENTR
- b. Observe:  
VERB 21 NOUN 22 Flashing  
ENTR
- c. +01600
- d. Observe:  
VERB 23 NOUN 22 Flashing  
ENTR
- e. +01600
88. Connect jumper between PROBES OUTPUT DIRECT Jacks and PAVM IN Jacks on Auxiliary Input Panel. Set PAVM Crossbar Control switch on Primary Signal Selector panel to AUX.
89. Connect SCA input to PAVM and SCA output to DVM by connecting PSA TPA direct probe to test points listed in table VIII and setting Test Selector panel to positions indicated. Record SCA total voltage input on PAVM and SCA output on DVM for each test.
90. Perform the following DSKY operations:
- a. VERB 36 ENTR
- b. VERB 41 NOUN 20 ENTR
- c. Observe:  
VERB 21 NOUN 22 Flashing  
ENTR
- d. +00000
- e. Observe:  
VERB 22 NOUN 22 Flashing  
ENTR
- f. +00000
- g. Observe:  
VERB 23 NOUN 22 Flashing  
ENTR
- h. +00000
91. Press POWER OFF on Resolver Circuit Tester Control Panel.
92. Disconnect cable W172 from GDB.

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Table VIII

Test	PSA TPA Test Points		Test Selector Panel Position	Signal
	High	Low		
a	TB4-43	TB4-47	114	Yaw attitude error
b	TB4-45	TB4-49	115	Pitch attitude error
c	TB4-44	TB4-48	116	Roll attitude error

C. CALCULATIONS

1. Perform following CDU fine error calculations:

a. IG CDU fine error =  $\frac{\text{SCA output (VDC)} - 2.5\text{V R\&D bias}}{2.00 \times \text{SCA input (VAC)}} = 1 (\pm 20\%)$

b. MG CDU fine error =  $\frac{\text{SCA output (VDC)} - 2.5\text{V R\&D bias}}{2.00 \times \text{SCA input (VAC)}} = 1 (\pm 20\%)$

c. OG CDU fine error =  $\frac{\text{SCA output (VDC)} - 2.5\text{V R\&D bias}}{2.00 \times \text{SCA input (VAC)}} = 1 (\pm 20\%)$

2. Perform following IX resolver sin  $\pm 10^\circ$  degree calculations:

a. OG IX resolver sin  $\pm 10^\circ = \frac{2 (\text{SCA output (VDC)} - 2.5\text{V PCM bias})}{\text{SCA input (VAC)}} = 1 (\pm 10\%)$

b. MG IX resolver sin  $\pm 10^\circ = \frac{2 (\text{SCA output (VDC)} - 2.5\text{V PCM bias})}{\text{SCA input (VAC)}} = 1 (\pm 10\%)$

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c. IG IX resolver sin  $\pm 10^\circ = \frac{2 (\text{SCA output (VDC)} - 2.5\text{V PCM bias})}{\text{SCA input (VAC)}} = 1 (\pm 10\%)$

3. Perform following IX resolver cos and sin calculations:

a. IG IX resolver cos =  $\frac{8.5 (\text{SCA output (VDC)} - 2.5\text{V PCM bias})}{\text{SCA input (VAC)}} = 1 (\pm 10\%)$

b. MG IX resolver cos =  $\frac{8.5 (\text{SCA output (VDC)} - 2.5\text{V PCM bias})}{\text{SCA input (VAC)}} = 1 (\pm 10\%)$

c. OG IX resolver cos =  $\frac{8.5 (\text{SCA output (VDC)} - 2.5\text{V PCM bias})}{\text{SCA input (VAC)}} = 1 (\pm 10\%)$

d. IG IX resolver sin =  $\frac{8.5 (\text{SCA output (VDC)} - 2.5\text{V PCM bias})}{\text{SCA input (VAC)}} = 1 (\pm 10\%)$

e. MG IX resolver sin =  $\frac{8.5 (\text{SCA output (VDC)} - 2.5\text{V PCM bias})}{\text{SCA input (VAC)}} = 1 (\pm 10\%)$

f. OG IX resolver sin =  $\frac{8.5 (\text{SCA output (VDC)} - 2.5\text{V PCM bias})}{\text{SCA input (VAC)}} = 1 (\pm 10\%)$

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4. Perform following attitude error calculations:

a. Yaw attitude error =  $\frac{2.44 (\text{SCA output (VDC)} - 2.5\text{V PCM bias})}{\text{SCA input (VAC)}} = 1 (\pm 10\%)$

b. Pitch attitude error =  $\frac{2.44 (\text{SCA output (VDC)} - 2.5\text{V PCM bias})}{\text{SCA input (VAC)}} = 1 (\pm 10\%)$

c. Roll attitude error =  $\frac{2.44 (\text{SCA output (VDC)} - 2.5\text{V PCM bias})}{\text{SCA input (VAC)}} = 1 (\pm 10\%)$

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APOLLO G&N  
EQUIPMENT TEST  
DATA SHEET 1 OF 18

JDC  
NO. 12620  
REV. C  
INITIAL TORR 32767

JOB LEM SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

ASSEMBLY UNDER TEST				TEST HISTORY			
TITLE	DATE	START	END	DATE	START	END	SITE / LOCATION
SER. NO. _____	DWG. _____	REV. _____	_____	TIME	START	END	TOTAL ELAPSED
MAJOR GROUND SUPPORT EQUIPMENT							
NAME _____	SER. NO. _____	CAL DATE _____					
NAME _____	SER. NO. _____	CAL DATE _____					

CONDUCTED BY _____		NAME/AFFILIATION _____		APPROVED BY _____		NAME/AFFILIATION _____	
JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ ACC	
A. 10	Bus Voltage	VDC	27.00		29.00		
B. 2	28 VDC LGC Operate	VDC	3.9		4.8		
B. 9	28 VDC IMU Standby	VDC	3.9		4.8		
	Loop Closure Test a						
	Loop Closure Test b						
	Loop Closure Test c						
B. 10	Bus Voltage	VDC	27.75		28.25		
B. 11	*Cal Module Temp.	VDC	0.40		1.28		
	*R&D 2.5 VDC Bias	VDC	2.47		2.53		
	*IMU Heater Current	VDC	3.9		4.80		
	PIPA Temperature	VDC	2.0		3.0		
	*RIG Temperature	VDC	2.37		3.70		
	120 VDC Reference	VDC	2.80		4.20		

\*Parameters not available in LEM Operational SCA,  
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APOLLO G&N  
EQUIPMENT TEST  
DATA SHEET 2 OF 18

JDC  
NO. 12620  
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JOB LEM SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ ACC
B. 11 (Cont)	2.5 VDC PCM Bias	VDC	2.47		2.53	
	3200 cps, 28V Supply	VDC	4.20		4.80	
	800 cps, 28V Supply	VDC	4.20		4.80	
B. 23.a	IG Servo Error Channel 1	V/PP				
	IG Servo Error Channel 8	V/PP	Channel 1 -15%		Channel 1 +15%	
B. 23.b	MG Servo Error Channel 2	V/PP				
	MG Servo Error Channel 8	V/PP	Channel 2 -15%		Channel 2 +15%	
B. 23.c	OG Servo Error Channel 3	V/PP				
	OG Servo Error Channel 8	V/PP	Channel 3 -15%		Channel 3 +15%	
B. 35.a	*IG TMC Channel 6	V/PP				
	*IG TMC Channel 8	V/PP	Channel 6 x 5.0 -15%		Channel 6 x 5.0 +15%	
B. 35.b	*MG TMC Channel 6	V/PP				
	*MG TMC Channel 8	V/PP	Channel 6 x 5.0 -15%		Channel 6 x 5.0 +15%	

\*Parameters not available in LEM Operational SCA,  
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EQUIPMENT TEST  
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JDC  
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JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ ACC
B. 35.c	*OG TMC Channel 6	V P/P				
	*OG TMC Channel 8	V P/P	Channel 6 x 2.75 -15%		Channel 6 x 2.75 +15%	
B. 40	*DSKY Row 1	Deg.				
	DSKY Row 2	Deg.				
	DSKY Row 3	Deg.				
B. 41	*DSKY Row 1	Deg.				
	DSKY Row 2	Deg.				
	DSKY Row 3	Deg.				
B. 41.a	R & D 2.5 VDC Bias	VDC				
B. 42.a	*IG CDU Fine Error (PAVM)	VAC				
	*IG CDU Fine Error (DVM)	VDC				
B. 42.b	*MG CDU Fine Error (PAVM)	VAC				
	*MG CDU Fine Error (DVM)	VDC				
B. 42.c	*OG CDU Fine Error (PAVM)	VAC				
	*OG CDU Fine Error (DVM)	VDC				

\*Parameters not available in LEM Operational SCA,  
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EQUIPMENT TEST  
DATA SHEET 4 OF 18

JDC  
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JOB LEM SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ ACC
B. 46.a	*OG IX Resolver Sin $\pm 10^\circ$	VAC				
	*OG IX Resolver Sin $\pm 10^\circ$	VDC				
B. 46.b	*MG IX Resolver Sin $\pm 10^\circ$	VAC				
	*MG IX Resolver Sin $\pm 10^\circ$	VDC				
B. 46.c	*IG IX Resolver Sin $\pm 10^\circ$	VAC				
	*IG IX Resolver Sin $\pm 10^\circ$	VDC				
	DSKY Row 1	Deg.				
	DSKY Row 2	Deg.				
	DSKY Row 3	Deg.				
B. 48.a	IG IX Resolver (45°) Cos (Test A) (TES 120)	VDC				
	IG IX Resolver (45°) Cos (Test A) (XBR 243)	VAC				
B. 48.b	MG IX Resolver (45°) Cos (Test B) (TES 121)	VDC				

\*Parameters not available in LEM Operational SCA,  
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EQUIPMENT TEST  
DATA SHEET 1 OF 18

JDC  
NO. 12620  
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JOB LEM SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ ACC
B. 49. b (cont)	MG IX Resolver (45°) Cos (Test B) (XBR 242)	VAC				
B. 49. c	OG IX Resolver (45°) Cos (Test C) (TES 122)	VDC				
	OG IX Resolver (45°) Cos (Test C) (XBR 241)	VAC				
B. 49. d	IG IX Resolver (45°) Sin (Test D) (TES 122)	VDC				
	IG IX Resolver (45°) Sin (Test D) (XBR 144)	VAC				
B. 49. e	MG IX Resolver (45°) Sin (Test E) (TES 124)	VDC				
	MG IX Resolver (45°) Sin (Test E) (XBR 143)	VAC				
B. 49. f	OG IX Resolver (45°) Sin (Test F) (TES 125)	VDC				

\*Parameters not available in LEM Operational SCA,  
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EQUIPMENT TEST  
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JDC  
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JOB LEM SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ ACC
B. 49. f (cont)	OG IX Resolver (45°) Sin (Test F) (XBR 142)	VAC				
B. 51	DSKY Row 1 DSKY Row 2 DSKY Row 3	Deg. Deg. Deg.				
B. 52. a	IG IX Resolver (135°) Cos (Test A) (TES 120)	VDC				
	IG IX Resolver (135°) Cos (Test A) (XBR 243)	VAC				
B. 52. b	MG IX Resolver (135°) Cos (Test B) (TES 121)	VDC				
	MG IX Resolver (135°) Cos (Test B) (XBR 242)	VAC				
B. 52. c	OG IX Resolver (135°) Cos (Test C) (TES 122)	VDC				
	OG IX Resolver (135°) Cos (Test C) (XBR 241)	VAC				

\*Parameters not available in LEM Operational SCA,  
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JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ ACC
B. 52. d	IG IX Resolver (135°) Sin (Test D) (TES 123)	VDC				
	IG IX Resolver (135°) Sin (Test D) (XBR 144)	VAC				
B. 52. e	MG IX Resolver (135°) Sin (Test E) (TES 124)	VDC				
	MG IX Resolver (135°) Sin (Test E) (XBR 143)	VAC				
B. 52. f	OG IX Resolver (135°) Sin (Test F) (TES 125)	VDC				
	OG IX Resolver (135°) Sin (Test F) (XBR 142)	VAC				
B. 54	DSKY Row 1 DSKY Row 2 DSKY Row 3	Deg. Deg. Deg.				
B. 55. a	IG IX Resolver (225°) Cos (Test A) (TES 120)	VDC				

\*Parameters not available in LEM Operational SCA,  
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JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ ACC
B. 55. a (cont)	IG IX Resolver (225°) Cos (Test A) (XBR 243)	VAC				
B. 55. b	MG IX Resolver (225°) Cos (Test B) (TES 121)	VDC				
	MG IX Resolver (225°) Cos (Test B) (XBR 242)	VAC				
B. 55. c	OG IX Resolver (225°) Cos (Test C) (TES 122)	VDC				
	OG IX Resolver (225°) Cos (Test C) (XBR 241)	VAC				
B. 55. d	IG IX Resolver (225°) Sin (Test D) (TES 123)	VDC				
	IG IX Resolver (225°) Sin (Test D) (XBR 144)	VAC				
B. 55. e	MG IX Resolver (225°) Sin (Test E) (TES 124)	VDC				

\*Parameters not available in LEM Operational SCA,  
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JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ/ACC
B.55.e (cont)	MG IX Resolver (225°) Sin (Test E) (XBR 143)	VAC				
B.55.f	OG IX Resolver (225°) Sin (Test F) (TES 125)	VDC				
	OG IX Resolver (225°) Sin (Test F) (XBR 142)	VAC				
B.57	DSKY Row 1 DSKY Row 2 DSKY Row 3					
B.58.a	IG IX Resolver (315°) Cos (Test A) (TES 120)	VDC				
	IG IX Resolver (315°) Cos (Test A) (XBR 243)	VAC				
B.58.b	MG IX Resolver (315°) Cos (Test B) (TES 121)	VDC				
	MG IX Resolver (315°) Cos (Test B) (XBR 242)	VAC				

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JOB LEM SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ/ACC
B.58.c	OG IX Resolver (315°) Cos (Test C) (TES 122)	VDC				
	OG IX Resolver (315°) (Test C) (XBR 241)	VAC				
B.58.d	IG IX Resolver (315°) Sin (Test D) (TES 123)	VDC				
	IG IX Resolver (315°) Sin (Test D) (XBR 144)	VAC				
B.58.e	MG IX Resolver (315°) Sin (Test E) (TES 124)	VDC				
	MG IX Resolver (315°) Sin (Test E) (XBR 143)	VAC				
B.58.f	OG IX Resolver (315°) Sin (Test F) (TES 125)	VDC				
	OG IX Resolver (315°) Sin (Test F) (XBR 142)	VAC	2.45		2.55	
B.67	*Shaft CDU Fine Error					

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JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ/ACC
B.68	*Shaft CDU Fine Error	VDC	3.75		4.25	
B.72	*Trunnion CDU Fine Error	VDC	3.75		4.25	
B.73	*Trunnion CDU Fine Error	VDC	2.45		2.55	
B.79	Trunnion IX Resolver Sin (TES 128)	VDC	4.45		4.95	
	Trunnion IX Resolver Cos (TES 131)	VDC	4.45		4.95	
B.82	Shaft IX Resolver Sin (TES 129)	VDC	4.45		4.95	
	Shaft IX Resolver Cos (TES 130)	VDC	4.45		4.95	
B.89.a	Yaw Attitude Error (PAVM)	VAC				
	Yaw Attitude Error (DVM) (TES 114)	VDC				
B.89.b	Pitch Attitude Error (PAVM)	VAC				

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JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ/ACC
B.89.b (cont)	Pitch Attitude Error (DVM) (TES 115)	VDC				
B.89.c	Roll Attitude Error (PAVM) Roll Attitude Error (DVM) (TES 116)	VAC  VDC				
CALCULATIONS						
C.1	$\text{*IG CDU fine error} = \frac{\text{SCA output (VDC)} - 2.5V \text{ R\&D bias}}{2.00 \times \text{SCA input (VAC)}} = 1 (\pm 20\%)$					
	$\text{*MG CDU fine error} = \frac{\text{SCA output (VDC)} - 2.5V \text{ R\&D bias}}{2.00 \times \text{SCA input (VAC)}} = 1 (\pm 20\%)$					
	$\text{*OG CDU fine error} = \frac{\text{SCA output (VDC)} - 2.5V \text{ R\&D bias}}{2.00 \times \text{SCA input (PAVM)}} = 1 (\pm 20\%)$					
C.2	$\text{*OG IX resolver sin } \pm 10^\circ = \frac{2 (\text{SCA output (VDC)} - 2.5V \text{ PCM bias})}{\text{SCA input (VAC)}} = 1 (\pm 10\%)$					

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CALCULATIONS	REJ	ACC
C.2 (cont)		
*MG IX resolver $\sin \pm 10^\circ = \frac{2 \text{ (SCA output (VDC) -2.5V PCM bias)}}{\text{SCA input (VAC)}}$ = 1 ( $\pm 10\%$ )		
*IG IX resolver $\sin \pm 10^\circ = \frac{2 \text{ (SCA output (VDC) -2.5V PCM bias)}}{\text{SCA input (VAC)}}$ = 1 ( $\pm 10\%$ )		
C.3		
IG IX resolver $\cos (45^\circ) = \frac{8.5 \text{ (SCA output (VDC)(B.49.a) -2.5V PCM bias)}}{\text{SCA input (VAC) (B.49.a)}}$ = 1 ( $\pm 10\%$ )		
MG IX resolver $\cos (45^\circ) = \frac{8.5 \text{ (SCA output (VDC)(B.49.b) -2.5V PCM bias)}}{\text{SCA input (VAC) (B.49.b)}}$ = 1 ( $\pm 10\%$ )		
OG IX resolver $\cos (45^\circ) = \frac{8.5 \text{ (SCA output (VDC)(B.49.c) -2.5V PCM bias)}}{\text{SCA input (VAC) (B.49.c)}}$ = 1 ( $\pm 10\%$ )		

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CALCULATIONS	REJ	ACC
C.3 (cont)		
IG IX resolver $\sin (45^\circ) = \frac{8.5 \text{ (SCA output (VDC)(B.49.d) -2.5V PCM bias)}}{\text{SCA input (VAC) (B.49.d)}}$ = 1 ( $\pm 10\%$ )		
MG IX resolver $\sin (45^\circ) = \frac{8.5 \text{ (SCA output (VDC)(B.49.e) -2.5V PCM bias)}}{\text{SCA input (VAC) (B.49.e)}}$ = 1 ( $\pm 10\%$ )		
OG IX resolver $\sin (45^\circ) = \frac{8.5 \text{ (SCA output (VDC)(B.49.f) -2.5V PCM bias)}}{\text{SCA input (VAC) (B.49.f)}}$ = 1 ( $\pm 10\%$ )		
IG IX resolver $\cos (135^\circ) = \frac{8.5 \text{ (SCA output (VDC)(B.52.a) -2.5V PCM bias)}}{\text{SCA input (VAC) (B.52.a)}}$ = 1 ( $\pm 10\%$ )		
MG IX resolver $\cos (135^\circ) = \frac{8.5 \text{ (SCA output (VDC)(B.52.b) -2.5V PCM bias)}}{\text{SCA input (VAC) (B.52.b)}}$ = 1 ( $\pm 10\%$ )		

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CALCULATIONS	REJ	ACC
C.3. (cont)		
OG IX resolver $\cos (135^\circ) = \frac{8.5 \text{ (SCA output (VDC)(B.52.c) -2.5V PCM bias)}}{\text{SCA input (VAC) (B.52.c)}}$ = 1 ( $\pm 10\%$ )		
IG IX resolver $\sin (135^\circ) = \frac{8.5 \text{ (SCA output (VDC)(B.52.d) -2.5V PCM bias)}}{\text{SCA input (VAC) (B.52.d)}}$ = 1 ( $\pm 10\%$ )		
MG IX resolver $\sin (135^\circ) = \frac{8.5 \text{ (SCA output (VDC)(B.52.e) -2.5V PCM bias)}}{\text{SCA input (VAC) (B.52.e)}}$ = 1 ( $\pm 10\%$ )		
OG IX resolver $\sin (135^\circ) = \frac{8.5 \text{ (SCA output (VDC)(B.52.f) -2.5V PCM bias)}}{\text{SCA input (VAC) (B.52.f)}}$ = 1 ( $\pm 10\%$ )		
IG IX resolver $\cos (225^\circ) = \frac{8.5 \text{ (SCA output (VDC)(B.55.a) -2.5V PCM bias)}}{\text{SCA input (VAC) (B.55.a)}}$ = -1 ( $\pm 10\%$ )		
MG IX resolver $\cos (225^\circ) = \frac{8.5 \text{ (SCA output (VDC)(B.55.b) -2.5V PCM bias)}}{\text{SCA input (VAC) (B.55.b)}}$ = -1 ( $\pm 10\%$ )		

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CALCULATIONS	REJ	ACC
C.3 (cont)		
OG IX resolver $\cos (225^\circ) = \frac{8.5 \text{ (SCA output (VDC)(B.55.c) -2.5V PCM bias)}}{\text{SCA input (VAC) (B.55.c)}}$ = -1 ( $\pm 10\%$ )		
IG IX resolver $\sin (225^\circ) = \frac{8.5 \text{ (SCA output (VDC)(B.55.d) -2.5V PCM bias)}}{\text{SCA input (VAC) (B.55.d)}}$ = 1 ( $\pm 10\%$ )		
MG IX resolver $\sin (225^\circ) = \frac{8.5 \text{ (SCA output (VDC)(B.55.e) -2.5V PCM bias)}}{\text{SCA input (VAC) (B.55.e)}}$ = 1 ( $\pm 10\%$ )		
OG IX resolver $\sin (225^\circ) = \frac{8.5 \text{ (SCA output (VDC)(B.55.f) -2.5V PCM bias)}}{\text{SCA input (VAC) (B.55.f)}}$ = 1 ( $\pm 10\%$ )		
IG IX resolver $\cos (315^\circ) = \frac{8.5 \text{ (SCA output (VDC)(B.58.a) -2.5V PCM bias)}}{\text{SCA input (VAC) (B.58.a)}}$ = 1 ( $\pm 10\%$ )		
MG IX resolver $\cos (315^\circ) = \frac{8.5 \text{ (SCA output (VDC)(B.58.b) -2.5V PCM bias)}}{\text{SCA input (VAC) (B.58.b)}}$ = 1 ( $\pm 10\%$ )		

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CALCULATIONS	REJ ACC
C.3 (cont)	
OG 1X resolver cos (315°) = $\frac{8.5 \text{ (SCA output (VDC) (B.58.c) -2.5V PCM bias)}}{\text{SCA input (VAC) (B.58.c)}}$ = 1 (±10%)	
IG 1X resolver sin (315°) = $\frac{8.5 \text{ (SCA output (VDC)(B.58.d) -2.5V PCM bias)}}{\text{SCA input (VAC) (B.58.d)}}$ = -1 (±10%)	
MG 1X resolver sin (315°) = $\frac{8.5 \text{ (SCA output (VDC)(B.58.e) -2.5V PCM bias)}}{\text{SCA input (VAC) (B.58.e)}}$ = -1 (±10%)	
OG 1X resolver sin (315°) = $\frac{8.5 \text{ (SCA output (VDC) (B.58.f) -2.5V PCM bias)}}{\text{SCA input (VAC) (B.58.f)}}$ = -1 (±10%)	
C.4 Yaw attitude error = $\frac{2.44 \text{ (SCA output (VDC)(B.89.a) -2.5V PCM bias)}}{\text{SCA input (VAC) (B.89.a)}}$ = 1 (±10%)	

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CALCULATIONS	REJ ACC
C.4 (cont)	
Pitch attitude error = $\frac{2.44 \text{ (SCA output (VDC)(B.89.b) -2.5V PCM bias)}}{\text{SCA input (VAC) (B.89.b)}}$ = 1 (±10%)	
Roll attitude error = $\frac{2.44 \text{ (SCA output (VDC) (B.89.c) -2.5V PCM bias)}}{\text{SCA input (VAC) (B.89.c)}}$ = 1 (±10%)	

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SUBSYSTEM LEM G & N SYSTEM

DESCRIPTION This JDC provides a functional checkout procedure for the Signal Conditioner Module. Functional operation is evaluated by checking Signal Conditioner Module input and output data for proper correlation. Procedural methods are incorporated to cause signal generation in normally muted loops where possible in a G and N test configuration for maximum detection capability.

Rev.	DATE	NO.	JDC	D.S.	APPROVAL	REFERENCES
1	8-24-67	34449	ALL	EA	MIT NASA	PS 6015000
2	8-31-67	34478	1, 2, 4-8, 10, 1-3, 12, 11, 13, 14	EA	JDC 12614	
3	10-10-67	34802	12	EA	IMPORTANT	See below
4	11-12-68	35421	1, 2, 4-12, 15, 16	EA	INTERVAL	
					TOOLS AND MATERIAL	

IMPORTANT: 1. Insure that connector assembly (2003099) is connected to the LGC test connector. 2. Step numbers preceded by an asterisk are not to be performed when testing with LEM Operational SCA, P/N 6007013. Perform all steps when testing with LEM Flight Qualification SCA, P/N 6007010.

3. Visually inspect J2 on Signal Conditioner Module (SCM) breakout box and 30J1 on SCA to insure that pins and sockets are not bent or damaged.

4. Carefully locate J2 on guide pins of 30J1; ease plug onto connector, maintaining parallelism between plug and connector as closely as possible; and engage jackscrews until finger tight.

5. Turn each jackscrew one turn at a time moving around connector in sequence until plug and connector are fully engaged.

6. Reinstall DSKY Mounting Pedestal with DSKY on the Component Mounting Plate, attach ground strap and mate cable W143 to DSKY.

VERIFICATION WITH SCL REQUIRED BEFORE USE

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FORM 0-10-1  
Chg. 1-5-60

SUBSYSTEM LEM G & N SYSTEM

off-setting zero line 12.5 mm to right of center line.

7. Insure that PROCEED indicator of PROCEED/ISS OPERATE pushbutton on Test Control panel is lighted and the STAND-BY requirements of JDC 12614 have been satisfied.

8. Press CHART SPEEDS 5 pushbutton on Oscilloscope Control panel and set CHART DRIVE switch to cm/hr.

9. Obtain oscilloscope record of PIPA loop closure data by performing following steps successively for each position of Test Selector panel listed in table 1:

a. After a minimum of 5 minutes in ISS STANDBY mode, set CHART DRIVE switch on oscilloscope control panel to MM/SEC and press PROCEED/ISS OPERATE pushbutton on Test Control panel.

b. Wait at least 10 seconds following PIPA loop closure when in tests a and b, then press the PROCEED/ISS STANDBY pushbutton. Following test c, allow system to remain in ISS OPERATE mode.

c. Following each test, set Chart Drive switch on oscilloscope control panel to cm/hr. Check oscilloscope recording for indications of PIPA loop closure on channel 8 correlating to the loop closure indications on channels 4, 5 and 6 respectively. Record that traces have centered after loop closure.

Test	Test Selector Panel Position	Signal
a	117	Z PIPA S/G in-phase output
b	118	Y PIPA S/G in-phase output
c	119	X PIPA S/G in-phase output

10. On the Primary Signal Selector panel, set the CROSSBAR CONTROL switches to 173 and adjust the G and N Power Adjust control on the Test Control panel until the DVM indicates 28 (40.25) vdc. Record DVM indication. Following measurement, return CROSSBAR CONTROL switches to 271.

11. Set Test Selector panel to positions indicated and measure and record following voltages on DVM:

NOTE: The SCA Test Inhibit Indicator on the Temperature Monitor Control panel will illuminate when the Test Selector Crossbar is in positions 201 and 202. Following measurements in these positions, push Signal Conditioner Level 2 Enable pushbutton and verify that the above inhibit indicator extinguishes.

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SUBSYSTEM LEM G & N SYSTEM

7. Perform JDC 12614 to place the G and N system in ISS STANDBY mode with the LGC operating.

8. Connect PSA Test Point Adapter (TPA #2) direct probes to TBI-29 (H) and TBS-22 (L).

9. Connect jumper between PROIBIS OUTPUT DIRECT Jacks and DVM IN Jacks on Auxiliary Input Panel.

NOTE: The 28 VDC G & N Power adjusted in the following step will vary as result of heater cycling.

10. On Primary Signal Selector panel, set CROSSBAR CONTROL switches to 120 and adjust G & N Power Adjust control on Test Control panel until DVM indicates 28 (41.0) vdc. Record DVM indication.

1. Connect SCA GSE Distribution Box (GDB) stepper switch to DVM by setting CROSSBAR CONTROL switches on Primary Signal Selector panel to 271.

NOTE: To position Test Selector panel, perform following operations:

a. Press SIGNAL CONTROLLER LEVEL 1 ENABLE pushbutton if first digit on Test Selector panel position is 1, or press SIGNAL CONDITIONER LEVEL 2 ENABLE pushbutton if first digit is 2.

ASSY

b. Press PUSH TO ADVANCE pushbutton until display indicates last two digits.

2. Set Test Selector panel to positions indicated and measure and record the following voltages on DVM.

Test Selector Panel Position Voltage

101 28 vdc LGC operate (GG1523X)

102 28 vdc IMU standby (GG1513X)

PIPA S/G OUTPUT

3. Connect following signals to oscilloscope by setting switches on Oscilloscope Signal Selector panel to positions indicated:

Switch Signal

CHANNEL 4 to 1 Z PIPA S/G output (GG2041V)

CHANNEL 5 to 1 Y PIPA S/G output (GG2021V)

CHANNEL 6 to 1 X PIPA S/G output (GG2001V)

CHANNEL 8 to 4 SCA GDB stepper switch

4. Insure that CH AC indicators are lighted for channels 4, 5, and 6.

5. Set Phase Selector switch on demods to variable and zero oscilloscope channels 4, 5, and 6. Set gains at 500 mv/mm following adjustments.

6. Set gain of oscilloscope channel 8 at 2 v/cm and zero adjust channel 8 for a centered trace with a 2.5 vdc bias input by

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Test Selector Panel Position

\*135 Cal. Mod. Temperature (GG6020T)

\*145 R & D 2.5 vdc bias (GG1111V)

\*150 IMU Heater Current (GG2302X)

201 PIPA Temperature (GG2300T)

\*202 IRG Temperature (GG2301T)

103 120 vdc Reference (GG1040V)

104 2.5 vdc PCM bias (GG1110V)

106 3200 cps 28 volt supply (GG1331V)

113 800 cps 28 volt supply (GG1201V)

IG, MG, AND OG SERVO ERRORS

12. Perform following DSKY operations:

a. VERB 36 ENTR

b. VERB 41 NOUN 20 ENTR

c. Observe:

VERB 21 NOUN 22 Flashing

d. +00000 ENTR

e. Observe:

VERB 22 NOUN 23 Flashing

f. +00000 ENTR

g. Observe:

VERB 23 NOUN 23 Flashing

h. +00000 ENTR

\*Not applicable to LEM Operational SCA, P/N 6007013.

ASSY

13. Deleted

14. Deleted

15. Deleted

16. Deleted

17. Set switches on Signal Generator as follows:

RANGE to X.01

FREQUENCY meter to 6.0

FUNCTION to SQUARE

DC BALANCE to midposition

AMPLITUDE to 70.

18. Perform the following DSKY operations:

a. VERB 42 ENTR

b. VERB 33 ENTR

19. Set FUNCTION control on PAVM to 0° and 3200 ~ positions.

20. Press GIMBAL SERVO TEST pushbutton on Test Selector panel. The pushbutton shall light.

21. Obtain stabilization loop servo error data by performing the following steps for each test listed in Table II:

a. Press to light TEST START pushbutton on Test Selector panel.

NOTE: The SCA input voltage will cause the PAVM to alternately swing left and right. Determine the maximum deflection in each direction. Add the absolute values to obtain maximum meter spread.

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- b. Record maximum meter spread of SCA input voltages on PAVM.
- NOTE: The SCA output voltage will cause the DVM to alternately indicate a high value and a low value. Determine each value. Subtract lower value from higher value to obtain maximum meter spread.
- c. Record maximum meter spread of SCA output voltages on DVM.
- d. Press TEST STOP pushbutton on Test Selector panel; the TEST START pushbutton shall go out.
22. Press to extinguish GIMBAL SERVO TEST pushbutton.
23. Deleted

Table II

Test	Gimbal Servo Switch Position (CROSSBAR to 271)	Test Selector Panel Position	Signal
a	1	137	IG servo error
b	2	138	MG servo error
c	3	139	OG servo error

\*Not applicable to LEM Operational SCA, P/N 6007013.

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- b. Set Test Selector Crossbar and Gimbal Servo Test switch as indicated.
- c. Press TEST START pushbutton on Test Selector panel. The pushbutton shall light.
- d. Increase Signal Generator Amplitude Control until the oscilloscope indicates value listed in table III for each test. Maintain Signal Generator setting for approximately 10 seconds, then return control to 0.
- e. Press TEST STOP pushbutton on the Test Selector panel. The pushbutton shall extinguish.
- \*34. Press the GIMBAL SERVO TEST pushbutton. The pushbutton shall extinguish. Set Oscilloscope pre-amps to OFF.
- \*35. Set Chart Drive switch on Oscilloscope Control panel to cm/hr. Record peak-to-peak SCA input signal monitored on channel 6 and peak-to-peak SCA output signal monitored on channel 8.
- \*IG, MG, AND OG CDU FINE ERRORS (GG2220, 2250 and 2280)
- \*36. Perform following DSKY operations:
- a. VERB 41 NOUN 20 ENTR
- b. Observe:
- VERB 31 NOUN 23 Flashing
- c. +00000
- d. Observe:
- VERB 22 NOUN 22 Flashing
- e. +00000
- f. Observe:
- VERB 23 NOUN 23 Flashing
- g. +00000
- \*37. Connect jumper between PROBES OUTPUT BUFFERED jacks and PAVM IN jacks on Auxiliary Input panel.
- \*38. Perform following DSKY operations:
- a. VERB 21 NOUN 01 ENTR
- b. 00370
- c. 16002
- d. VERB 57
- e. 00003
- f. Observe:
- VERB 06 NOUN 61 Flashing
- g. VERB 21
- h. +00000
- i. VERB 22
- j. SITE LATITUDE VALUE from Table IV
- k. VERB 33
- l. 00004
- m. 00001

\*Not applicable to LEM Operational SCA, P/N 6007013.

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Table III

Test	Signal Generator Output On Oscilloscope	PSA TPA Test Points	Test Selector Panel Position	GIMBAL SERVO TEST Switch Position	Signal
a	2V peak-to-peak	TB2-31	132	1	IG torque motor curr.
b	1V peak-to-peak	TB2-32	133	2	MG torque motor curr.
c	1V peak-to-peak	TB1-45	134	3	OG torque motor curr.

- a. Observe:
- VERB 21 NOUN 22 Flashing
- o. +00100
- p. Observe:
- VERB 21 NOUN 22 Flashing
- q. +00100
- r. Observe:
- VERB 23 NOUN 22 Flashing
- s. +00100
- \*40. Monitor and record contents of  $R_1$ ,  $R_2$  and  $R_3$  on DSKY.
- \*41. In approximately 120 seconds, monitor and record the contents of  $R_1$ ,  $R_2$  and  $R_3$  again.
- 41A. Set Test Selector panel to position 145 and CROSSBAR CONTROL to 271. Record the R & D 2.5 VDC Bias indicated on the DVM.
- \*42. Connect SCA input to PAVM and SCA output to DVM by connecting PSA TPA buffered probes to test points listed in table V and setting Test Selector panel to positions indicated. Record SCA in-phase input voltage on PAVM and SCA output voltage on DVM SIMULTANEOUSLY for each test.
- NOTE: Due to earth rate, the voltages recorded in Table V will vary.

Table IV

Test Site	Latitude
MIT	+42.366
ACSP	+42.902
GAEC	+40.748
MSC	+29.556
KSC	+28.516
NAA	+33.921

- \*39. Within 10 to 90 seconds following step 38, perform the following DSKY operations:
- a. VERB 21 NOUN 01 ENTR
- b. 02512
- c. 00000
- d. VERB 16 NOUN 20 ENTR

\*Not applicable to LEM Operational SCA, P/N 6007013.

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ASSY

Table V

Test	PSA TPA Test Points	Test Selector Panel Position	Signal
a	TB3-37	140	IG CDU fine error
b	TB3-38	141	MG CDU fine error
c	TB3-41	142	OG CDU fine error

- \*43. Perform the following DSKY operations:
- a. VERB 21 NOUN 01 ENTR
- b. 02512
- c. 77776
- \*IG, MG, AND OG LX RESOLVER SIN  $\pm 10$  DEGREES (GG2121, 2151, and 2181)

- \*44. Perform following DSKY operations:
- a. VERB 41 NOUN 20 ENTR
- b. Observe:
- VERB 21 NOUN 22 Flashing
- c. +01000
- d. Observe:
- VERB 23 NOUN 22 Flashing
- e. +01000
- f. Observe:
- VERB 23 NOUN 22 Flashing
- g. +01000
- \*45. On DSKY, enter V16 N20 ENTR and verify that contents of  $R_1$ ,  $R_2$ , and  $R_3$  are approximately 01000.

Table VI

Test	CROSSBAR Test Position	Test Selector Panel Position	Signal
a	142	203	OG LX resolver $\sin \pm 10^\circ$
b	144	204	IG LX resolver $\sin \pm 10^\circ$
c	143	205	MG LX resolver $\sin \pm 10^\circ$

Table VII

- \*46. Alternately connect SCA input and SCA output to DVM by setting Test Selector panel and CROSSBAR CONTROL switches to positions listed in table VI. For each test, perform following operations:
- a. Set CROSSBAR CONTROL switches to 271.
- b. Set Test Selector panel to position listed in table VI and record SCA output indicated on DVM.
- c. Set CROSSBAR CONTROL switches to position listed in table VI and record SCA input indicated on DVM.
- \*47. Perform following DSKY operations:
- a. VERB 41 NOUN 20 ENTR
- b. Observe:
- VERB 21 NOUN 22 Flashing
- c. +04500
- d. Observe:
- VERB 23 NOUN 22 Flashing
- e. +04500

\*Not applicable to LEM Operational SCA, P/N 6007013.

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- f. Observe:  
1. VERB 23 NOUN 22 Flashing  
g. +04500  
h. VERB 16 NOUN 20 ENTR  
48. Monitor and record the contents of  $R_1$ ,  $R_2$ , and  $R_3$ .  
49. Alternately connect SCA output and SCA input to DVM for each test listed in table VII. For each test, perform following operations:  
a. Set CROSSBAR CONTROL switches to 271.  
b. Set Test Selector panel to position listed in table VII and record SCA output indicated on DVM.  
c. Immediately set CROSSBAR CONTROL to position listed in table VII and record SCA input indicated on DVM.

Test	CROSSBAR CONTROL Position	Test Selector Panel Position	Signal
a	243	120	IG IX resolver cos (GG2113V)
b	242	121	MG IX resolver cos (GG2143V)
c	241	122	OG IX resolver cos (GG2173V)
d	144	123	IG IX resolver sin (GG2112V)
e	143	124	MG IX resolver sin (GG2142V)
f	142	125	OG IX resolver sin (GG2172V)

50. Perform following DSKY operations:  
a. VERB 41 NOUN 20 ENTR  
b. Observe:  
VERB 21 NOUN 22 Flashing  
c. +22500  
d. Observe:  
VERB 22 NOUN 22 Flashing  
e. +22500  
f. Observe:  
VERB 23 NOUN 22 Flashing  
g. +22500  
h. VERB 16 NOUN 20 ENTR  
54. Monitor and record the contents of  $R_1$ ,  $R_2$ , and  $R_3$ .  
55. Repeat step 49.  
56. Perform following DSKY operations:  
a. VERB 41 NOUN 20 ENTR  
b. VERB 21 NOUN 22 Flashing  
c. +31500

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- d. Observe:  
VERB 22 NOUN 22 Flashing  
e. +31500  
f. Observe:  
VERB 23 NOUN 22 Flashing  
g. +31500  
h. VERB 16 NOUN 20 ENTR  
57. Monitor and record the contents of  $R_1$ ,  $R_2$ , and  $R_3$ .  
58. Repeat step 49.  
59. Perform following DSKY operations:  
a. VERB 41 NOUN 20 ENTR  
b. Observe:  
VERB 21 NOUN 22 Flashing  
c. +00000  
d. Observe:  
VERB 22 NOUN 22 Flashing  
e. +00000  
f. Observe:  
VERB 23 NOUN 22 Flashing  
g. +00000  
\*RR SHAFT AND TRUNNION FINE ERROR (GG3314V and 3321V)  
60. Resolver Circuit Tester Preparation (RCT)  
a. Set all decade error bridge switches and controls to OFF, minimum or zero.  
b. Connect cable W172 to GSE distribution box (GDB).  
c. Connect RCT power cable to facility 115 vac power.  
\*Not applicable to LEM Operational SCA, P/N 6007013

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ASSY

- \*65. Perform following DSKY operations:  
a. VERB 40 NOUN 40 ENTR  
b. VERB 21 NOUN 10 ENTR  
c. 00012  
d. 00011  
\*66. Monitor SCA input on PAVM by connecting PSA TPA buffered probe to TB3-33 (hi) and TB3-34 (lo) and connecting a jumper between PROBES OUTPUT BUFFERED jacks and PAVM IN jacks on Auxiliary Input panel. Set PAVM Crossbar Control switch on Primary Signal Selector panel to AUX.  
\*67. Adjust RESOLVER ANGLE TRANSMITTER control to produce a minimum total voltage signal on PAVM. Record DVM indication.  
\*68. Adjust RESOLVER ANGLE TRANSMITTER control until the in-phase voltage on the PAVM is +720 mv. Record the DVM indication.  
\*69. Press TRUN SELECT/SET ENABLE pushbutton. Both halves of pushbutton will light.  
\*70. Connect trunnion CDU fine error output from SCA to DVM by setting Test Selector panel to 147.  
\*71. Remove PSA TPA buffered probe from TB3-33 (hi) and connect to TB3-30 (hi).  
\*72. Adjust RESOLVER ANGLE TRANSMITTER control until in-phase voltage on the PAVM is +720 mv. Record the DVM indication.

\*Not applicable to LEM Operational SCA, P/N 6007013.

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ASSY

- \*73. Adjust RESOLVER ANGLE TRANSMITTER control until PAVM indicates minimum total voltage signal. Record DVM indication.  
\*74. Perform following DSKY operations:  
a. VERB 21 NOUN 10 ENTR  
b. 00012  
c. 00010  
\*RR SHAFT AND TRUNNION IX RESOLVER SIN AND COS  
75. Perform following DSKY operations:  
VERB 36 ENTR  
VERB 40 NOUN 40 ENTR  
76. Set the following switches on the DEB and RCT control panel:  
a. DEB - reference quadrant to  $0^\circ - 90^\circ$ .  
b. DEB - sensitivity to fully CCW.  
c. RCT - perform step 80g.  
d. RCT - set mode to lighted.  
e. DEB - degrees to 45,000.  
f. RCT - MON COARSE to lighted.  
g. RCT - resolver angle transmitter to 45,000.  
h. DEB/RCT - adjust transmitter and sensitivity dial to achieve best null on most sensitive coarse scale.  
i. DEB - set sensitivity to fully CCW.  
j. RCT - MON FINE to lighted.  
k. DEB - degrees to  $0 + 00000$ .  
l. DEB/RCT - adjust transmitter and sensitivity to achieve best null and most sensitive fine scale.  
m. DEB - sensitivity to fully CCW.  
n. RCT - remove switch setting from step c.  
\*Not applicable to LEM Operational SCA, P/N 6007013.

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83. Set RESOLVER ANGLE TRANSMITTER control to 0.
84. Set 800 REFERENCE INPUT VOLTAGE switch on Decade Error Bridge panel to OFF.
- YAW, PITCH, AND ROLL ATTITUDE ERRORS (GG2249V, 2219V and 2279V)
85. Perform following DSKY operations:
- a. VERB 41 NOUN 20 ENTR
- b. Observe:
- VERB 21 NOUN 23 Flashing
- c. +00000
- d. Observe:
- VERB 23 NOUN 23 Flashing
- e. +00000
- f. Observe:
- VERB 23 NOUN 22 Flashing
- g. +00000
86. Perform following DSKY operations:
- a. VERB 21 NOUN 10 ENTR
- b. 00013
- c. 00060
- NOTE: ESS warning lamp on Monitor panel may light during step 86. Ignore lamp indication.
87. Perform following DSKY operations:
- a. VERB 43 ENTR
- b. Observe:
- VERB 21 NOUN 23 Flashing
- c. +01600
- d. Observe:
- VERB 23 NOUN 23 Flashing
- e. +01600
91. Press POWER OFF on Resolver Circuit Tester Control Panel.
92. Disconnect cable W175 from GDB.

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c. IG IX resolver  $\sin \pm 10^\circ = \frac{2 \text{ (SCA output (VDC) - 2.5V PCM bias)}}{\text{SCA input (VAC)}} = 1 (\pm 10\%)$

3. Perform following IX resolver cos and sin calculations:

a. IG IX resolver  $\cos = \frac{8.5 \text{ (SCA output (VDC) - 2.5V PCM bias)}}{\text{SCA input (VAC)}} = 1 (\pm 10\%)$

b. MG IX resolver  $\cos = \frac{8.5 \text{ (SCA output (VDC) - 2.5V PCM bias)}}{\text{SCA input (VAC)}} = 1 (\pm 10\%)$

c. OG IX resolver  $\cos = \frac{8.5 \text{ (SCA output (VDC) - 2.5V PCM bias)}}{\text{SCA input (VAC)}} = 1 (\pm 10\%)$

d. IG IX resolver  $\sin = \frac{8.5 \text{ (SCA output (VDC) - 2.5V PCM bias)}}{\text{SCA input (VAC)}} = 1 (\pm 10\%)$

e. MG IX resolver  $\sin = \frac{8.5 \text{ (SCA output (VDC) - 2.5V PCM bias)}}{\text{SCA input (VAC)}} = 1 (\pm 10\%)$

f. OG IX resolver  $\sin = \frac{8.5 \text{ (SCA output (VDC) - 2.5V PCM bias)}}{\text{SCA input (VAC)}} = 1 (\pm 10\%)$

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SUBSYSTEM LEM G & N SYSTEM

ASSY

Table VIII

Test	PSA TPA Test Points		Test Selector Panel Position	Signal
	High	Low		
a	TB4-43	TB4-47	114	Yaw attitude error
b	TB4-45	TB4-49	115	Pitch attitude error
c	TB4-44	TB4-48	116	Roll attitude error

C. CALCULATIONS

1. Perform following CDU fine error calculations:

a. IG CDU fine error =  $\frac{\text{SCA output (VDC) - 2.5V R\&D bias}}{2.00 \times \text{SCA input (VAC)}} = 1 (\pm 20\%)$

b. MG CDU fine error =  $\frac{\text{SCA output (VDC) - 2.5V R\&D bias}}{2.00 \times \text{SCA input (VAC)}} = 1 (\pm 20\%)$

c. OG CDU fine error =  $\frac{\text{SCA output (VDC) - 2.5V R\&D bias}}{2.00 \times \text{SCA input (VAC)}} = 1 (\pm 20\%)$

2. Perform following IX resolver sin  $\pm 10$  degree calculations:

a. OG IX resolver  $\sin \pm 10^\circ = \frac{2 \text{ (SCA output (VDC) - 2.5V PCM bias)}}{\text{SCA input (VAC)}} = 1 (\pm 10\%)$

b. MG IX resolver  $\sin \pm 10^\circ = \frac{2 \text{ (SCA output (VDC) - 2.5V PCM bias)}}{\text{SCA input (VAC)}} = 1 (\pm 10\%)$

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ASSY

4. Perform following attitude error calculations:

a. Yaw attitude error =  $\frac{2.44 \text{ (SCA output (VDC) - 2.5V PCM bias)}}{\text{SCA input (VAC)}} = 1 (\pm 10\%)$

b. Pitch attitude error =  $\frac{2.44 \text{ (SCA output (VDC) - 2.5V PCM bias)}}{\text{SCA input (VAC)}} = 1 (\pm 10\%)$

c. Roll attitude error =  $\frac{2.44 \text{ (SCA output (VDC) - 2.5V PCM bias)}}{\text{SCA input (VAC)}} = 1 (\pm 10\%)$

5. Perform the following servo error calculations:

a. IG servo error =  $\frac{\text{SCA output (VDC)}}{\text{SCA input (VAC)}} = 0.91 (\pm 15\%)$

b. MG servo error =  $\frac{\text{SCA output (VDC)}}{\text{SCA input (VAC)}} = 0.91 (\pm 15\%)$

c. OG servo error =  $\frac{\text{SCA output (VDC)}}{\text{SCA input (VAC)}} = 0.91 (\pm 15\%)$

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ASSEMBLY UNDER TEST		TEST HISTORY	
TITLE	DATE	START	END
SER. NO.	DWG	REV.	SITE / LOCATION
NAME		TIME	END
NAME		START	TOTAL ELAPSED
MAJOR GROUND SUPPORT EQUIPMENT			
NAME	SER. NO.	CAL DATE	
NAME	SER. NO.	CAL DATE	
CONDUCTED BY		APPROVED BY	
NAME/AFFILIATION		NAME/AFFILIATION	

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ ACC
A. 10	Bus Voltage	VDC	27.00		29.00	
B. 2	28 VDC LGC	VDC	3.9		4.8	
	Operate					
	Standby					
B. 9	Loop Closure	VDC	3.9		4.8	
	Test a					
	Loop Closure					
	Test b					
	Loop Closure					
	Test c					
B. 10	Bus Voltage	VDC	27.75		28.25	
B. 11	*Cal Module Temp.	VDC	0.40		1.26	
	*RAD 2.5 VDC Bias	VDC	2.47		2.53	
	*IMU Heater	VDC	3.9		4.80	
	Current					
	PIPA Temperature	VDC	2.0		3.0	
	*TRIG Temperature	VDC	2.37		3.70	
	120 VDC Reference	VDC	2.80		4.20	

\*Parameters not available in LEM Operational SCA,  
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JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ ACC
B. 11	2.5 VDC PCM Bias	VDC	2.47		2.53	
	3200 cps, 28V	VDC	4.20		4.80	
	Supply					
	800 cps, 28V	VDC	4.20		4.80	
	Supply					
B. 21	IG Servo Error SCA	VAC				
	Input (Test a)					
	IG Servo Error SCA	VDC				
	output (Test a)					
	MG Servo Error	VAC				
	SCA Input (Test b)					
	MG Servo Error	VDC				
	SCA output (Test b)					
	OG Servo Error	VAC				
	SCA Input (Test c)					
	OG Servo Error	VDC				
	SCA output (Test c)					
B. 35.a	*IG TMC Channel 6	V/PP	Channel 6 x 5.0 -15%		Channel 6 x 5.0 +15%	
	*IG TMC Channel 8	V/PP	Channel 6 x 5.0 -15%		Channel 6 x 5.0 +15%	
B. 35.b	*MG TMC	V/PP				
	Channel 6					
	*MG TMC	V/PP	Channel 6 x 5.0 -15%		Channel 6 x 5.0 +15%	
	Channel 8					

\*Parameters not available in LEM Operational SCA,  
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JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ ACC
B. 35.c	*OG TMC	V P/P				
	Channel 6					
	*OG TMC	V P/P	Channel 6 x 2.75 -15%		Channel 6 x 2.75 +15%	
	Channel 8					
B. 40	*DSKY Row 1	Deg.				
	DSKY Row 2	Deg.				
	DSKY Row 3	Deg.				
B. 41	*DSKY Row 1	Deg.				
	DSKY Row 2	Deg.				
	DSKY Row 3	Deg.				
B. 41.a	R & D 2.5 VDC	VDC				
	Bias					
B. 42.a	*IG CDU Fine	VAC				
	Error (PAVM)					
	*IG CDU Fine	VDC				
	Error (DVM)					
B. 42.b	*MG CDU Fine	VAC				
	Error (PAVM)					
	*MG CDU Fine	VDC				
	Error (DVM)					
B. 42.c	*OG CDU Fine	VAC				
	Error (PAVM)					
	*OG CDU Fine	VDC				
	Error (DVM)					

\*Parameters not available in LEM Operational SCA,  
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JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ ACC
B. 46.a	*OG IX Resolver	VAC				
	Sin ±10°					
	*OG IX Resolver	VDC				
	Sin ±10°					
B. 46.b	*MG IX Resolver	VAC				
	Sin ±10°					
	*MG IX Resolver	VDC				
	Sin ±10°					
B. 46.c	*IG IX Resolver	VAC				
	Sin ±10°					
	*IG IX Resolver	VDC				
	Sin ±10°					
B. 48	DSKY Row 1	Deg.				
	DSKY Row 2	Deg.				
	DSKY Row 3	Deg.				
B. 49.a	IG IX Resolver	VDC				
	(45°) Cos (Test A)					
	(TES 120)					
	IG IX Resolver	VAC				
	(45°) Cos (Test A)					
	(XBR 243)					
B. 49.b	MG IX Resolver	VDC				
	(45°) Cos (Test B)					
	(TES 121)					

\*Parameters not available in LEM Operational SCA,  
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JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ/ACC
B. 49. b (cont)	MG IX Resolver (45°) Cos (Test B) (XBR 243)	VAC				
B. 49. c	OG IX Resolver (45°) Cos (Test C) (TES 122)	VDC				
	OG IX Resolver (45°) Cos (Test C) (XBR 241)	VAC				
B. 49. d	IG IX Resolver (45°) Sin (Test D) (TES 122)	VDC				
	IG IX Resolver (45°) Sin (Test D) (XBR 144)	VAC				
B. 49. e	MG IX Resolver (45°) Sin (Test E) (TES 124)	VDC				
	MG IX Resolver (45°) Sin (Test E) (XBR 143)	VAC				
B. 49. f	OG IX Resolver (45°) Sin (Test F) (TES 125)	VDC				

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JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ/ACC
B. 49. f (cont)	OG IX Resolver (45°) Sin (Test F) (XBR 142)	VAC				
B. 51	DSKY Row 1 DSKY Row 2 DSKY Row 3	Deg. Deg. Deg.				
B. 52. a	IG IX Resolver (135°) Cos (Test A) (TES 120)	VDC				
	IG IX Resolver (135°) Cos (Test A) (XBR 243)	VAC				
B. 52. b	MG IX Resolver (135°) Cos (Test B) (TES 121)	VDC				
	MG IX Resolver (135°) Cos (Test B) (XBR 242)	VAC				
B. 52. c	OG IX Resolver (135°) Cos (Test C) (TES 122)	VDC				
	OG IX Resolver (135°) Cos (Test C) (XBR 241)	VAC				

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JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ/ACC
B. 52. d	IG IX Resolver (135°) Sin (Test D) (TES 123)	VDC				
	IG IX Resolver (135°) Sin (Test D) (XBR 144)	VAC				
B. 52. e	MG IX Resolver (135°) Sin (Test E) (TES 124)	VDC				
	MG IX Resolver (135°) Sin (Test E) (XBR 143)	VAC				
B. 52. f	OG IX Resolver (135°) Sin (Test F) (TES 125)	VDC				
	OG IX Resolver (135°) Sin (Test F) (XBR 142)	VAC				
B. 54	DSKY Row 1 DSKY Row 2 DSKY Row 3	Deg. Deg. Deg.				
B. 55. a	IG IX Resolver (225°) Cos (Test A) (TES 120)	VDC				

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JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ/ACC
B. 55. a (cont)	IG IX Resolver (225°) Cos (Test A) (XBR 243)	VAC				
B. 55. b	MG IX Resolver (225°) Cos (Test B) (TES 121)	VDC				
	MG IX Resolver (225°) Cos (Test B) (XBR 242)	VAC				
B. 55. c	OG IX Resolver (225°) Cos (Test C) (TES 122)	VDC				
	OG IX Resolver (225°) Cos (Test C) (XBR 241)	VAC				
B. 55. d	IG IX Resolver (225°) Sin (Test D) (TES 123)	VDC				
	IG IX Resolver (225°) Sin (Test D) (XBR 144)	VAC				
B. 55. e	MG IX Resolver (225°) Sin (Test E) (TES 124)	VDC				

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JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ/ACC
B. 55.e (cont)	MG 1X Resolver (225°) Sin (Test E) (XBR 143)	VAC				
B. 55.f	OG 1X Resolver (225°) Sin (Test F) (TES 125)	VDC				
	OG 1X Resolver (225°) Sin (Test F) (XBR 142)	VAC				
B. 57	DSKY Row 1					
	DSKY Row 2					
	DSKY Row 3					
B. 58.a	IG 1X Resolver (315°) Cos (Test A) (TES 120)	VDC				
	IG 1X Resolver (315°) Cos (Test A) (XBR 243)	VAC				
B. 58.b	MG 1X Resolver (315°) Cos (Test B) (TES 121)	VDC				
	MG 1X Resolver (315°) Cos (Test B) (XBR 242)	VAC				

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JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ/ACC
B. 58.c	OG 1X Resolver (315°) Cos (Test C) (TES 122)	VDC				
	OG 1X Resolver (315°) (Test C) (XBR 241)	VAC				
B. 58.d	IG 1X Resolver (315°) Sin (Test D) (TES 123)	VDC				
	IG 1X Resolver (315°) Sin (Test D) (XBR 144)	VAC				
B. 58.e	MG 1X Resolver (315°) Sin (Test E) (TES 124)	VDC				
	MG 1X Resolver (315°) Sin (Test E) (XBR 143)	VAC				
B. 58.f	OG 1X Resolver (315°) Sin (Test F) (TES 125)	VDC				
	OG 1X Resolver (315°) Sin (Test F) (XBR 142)	VAC				
B. 67	*Shaft CDU Fine Error	VDC	2.45		2.55	

\*Parameters not available in LEM Operational SCA,  
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JDC  
NO. 12620  
REV. D

JOB LEM SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ/ACC
B. 68	*Shaft CDU Fine Error	VDC	3.75		4.25	
B. 72	*Trunnion CDU Fine Error	VDC	3.75		4.25	
B. 73	*Trunnion CDU Fine Error	VDC	2.45		2.55	
B. 79	Trunnion 1X Resolver Sin (TES 128)	VDC	4.45		4.95	
	Trunnion 1X Resolver Cos (TES 131)	VDC	4.45		4.95	
B. 82	Shaft 1X Resolver Sin (TES 129)	VDC	4.45		4.95	
	Shaft 1X Resolver Cos (TES 130)	VDC	4.45		4.95	
B. 89.a	Yaw Attitude Error (PAVM)	VAC				
	Yaw Attitude Error (DVM) (TES 114)	VDC				
B. 89.b	Pitch Attitude Error (PAVM)	VAC				

\*Parameters not available in LEM Operational SCA,  
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JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ/ACC
B. 89.b (cont)	Pitch Attitude Error (DVM) (TES 115)	VDC				
B. 89.c	Roll Attitude Error (PAVM) Roll Attitude Error (DVM) (TES 116)	VAC  VDC				
CALCULATIONS						
C. 1	$\text{SCA output (VDC) } -2.5\text{V R\&D bias} = 1 (\pm 20\%)$ $\text{*IG CDU fine error} = \frac{\text{SCA output (VDC) } -2.5\text{V R\&D bias}}{2.00 \times \text{SCA input (VAC)}} = 1 (\pm 20\%)$ $\text{*MG CDU fine error} = \frac{\text{SCA output (VDC) } -2.5\text{V R\&D bias}}{2.00 \times \text{SCA input (VAC)}} = 1 (\pm 20\%)$ $\text{*OG CDU fine error} = \frac{\text{SCA output (VDC) } -2.5\text{V R\&D bias}}{2.00 \times \text{SCA input (PAVM)}} = 1 (\pm 20\%)$					
C. 2	$\text{*OG 1X resolver sin } \pm 10^\circ = \frac{2 (\text{SCA output (VDC) } -2.5\text{V PCM bias})}{\text{SCA input (VAC)}} = 1 (\pm 10\%)$					

\*Parameters not available in LEM Operational SCA,  
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JOB LEM SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

CALCULATIONS	REJ	ACC
C.3 (cont)		
*MG 1X resolver sin $\pm 10^\circ = \frac{2 \text{ (SCA output (VDC) -2.5V PCM bias)}}{\text{SCA input (VAC)}}$ = 1 ( $\pm 10\%$ )		
*IG 1X resolver sin $\pm 10^\circ = \frac{2 \text{ (SCA output (VDC) -2.5V PCM bias)}}{\text{SCA input (VAC)}}$ = 1 ( $\pm 10\%$ )		
C.3		
IG 1X resolver cos $(45^\circ) = \frac{8.5 \text{ (SCA output (VDC) (B.49.a) -2.5V PCM bias)}}{\text{SCA input (VAC) (B.49.a)}}$ = 1 ( $\pm 10\%$ )		
MG 1X resolver cos $(45^\circ) = \frac{8.5 \text{ (SCA output (VDC) (B.49.b) -2.5V PCM bias)}}{\text{SCA input (VAC) (B.49.b)}}$ = 1 ( $\pm 10\%$ )		
OG 1X resolver cos $(45^\circ) = \frac{8.5 \text{ (SCA output (VDC) (B.49.c) -2.5V PCM bias)}}{\text{SCA input (VAC) (B.49.c)}}$ = 1 ( $\pm 10\%$ )		

\*Parameters not available in LEM Operational SCA,  
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CALCULATIONS	REJ	ACC
C.3 (cont)		
IG 1X resolver sin $(45^\circ) = \frac{8.5 \text{ (SCA output (VDC) (B.49.d) -2.5V PCM bias)}}{\text{SCA input (VAC) (B.49.d)}}$ = 1 ( $\pm 10\%$ )		
MG 1X resolver sin $(45^\circ) = \frac{8.5 \text{ (SCA output (VDC) (B.49.e) -2.5V PCM bias)}}{\text{SCA input (VAC) (B.49.e)}}$ = 1 ( $\pm 10\%$ )		
OG 1X resolver sin $(45^\circ) = \frac{8.5 \text{ (SCA output (VDC) (B.49.f) -2.5V PCM bias)}}{\text{SCA input (VAC) (B.49.f)}}$ = 1 ( $\pm 10\%$ )		
IG 1X resolver cos $(135^\circ) = \frac{8.5 \text{ (SCA output (VDC) (B.52.a) -2.5V PCM bias)}}{\text{SCA input (VAC) (B.52.a)}}$ = -1 ( $\pm 10\%$ )		
MG 1X resolver cos $(135^\circ) = \frac{8.5 \text{ (SCA output (VDC) (B.52.b) -2.5V PCM bias)}}{\text{SCA input (VAC) (B.52.b)}}$ = -1 ( $\pm 10\%$ )		

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JOB LEM SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

CALCULATIONS	REJ	ACC
C.3. (cont)		
OG 1X resolver cos $(135^\circ) = \frac{8.5 \text{ (SCA output (VDC) (B.52.c) -2.5V PCM bias)}}{\text{SCA input (VAC) (B.52.c)}}$ = -1 ( $\pm 10\%$ )		
IG 1X resolver sin $(135^\circ) = \frac{8.5 \text{ (SCA output (VDC) (B.52.d) -2.5V PCM bias)}}{\text{SCA input (VAC) (B.52.d)}}$ = 1 ( $\pm 10\%$ )		
MG 1X resolver sin $(135^\circ) = \frac{8.5 \text{ (SCA output (VDC) (B.52.e) -2.5V PCM bias)}}{\text{SCA input (VAC) (B.52.e)}}$ = 1 ( $\pm 10\%$ )		
OG 1X resolver sin $(225^\circ) = \frac{8.5 \text{ (SCA output (VDC) (B.52.f) -2.5V PCM bias)}}{\text{SCA input (VAC) (B.52.f)}}$ = 1 ( $\pm 10\%$ )		
IG 1X resolver cos $(225^\circ) = \frac{8.5 \text{ (SCA output (VDC) (B.55.a) -2.5V PCM bias)}}{\text{SCA input (VAC) (B.55.a)}}$ = -1 ( $\pm 10\%$ )		
MG 1X resolver cos $(225^\circ) = \frac{8.5 \text{ (SCA output (VDC) (B.55.b) -2.5V PCM bias)}}{\text{SCA input (VAC) (B.55.b)}}$ = -1 ( $\pm 10\%$ )		

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JOB LEM SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

CALCULATIONS	REJ	ACC
C.3 (cont)		
OG 1X resolver cos $(225^\circ) = \frac{8.5 \text{ (SCA output (VDC) (B.55.c) -2.5V PCM bias)}}{\text{SCA input (VAC) (B.55.c)}}$ = -1 ( $\pm 10\%$ )		
IG 1X resolver sin $(225^\circ) = \frac{8.5 \text{ (SCA output (VDC) (B.55.d) -2.5V PCM bias)}}{\text{SCA input (VAC) (B.55.d)}}$ = -1 ( $\pm 10\%$ )		
MG 1X resolver sin $(225^\circ) = \frac{8.5 \text{ (SCA output (VDC) (B.55.e) -2.5V PCM bias)}}{\text{SCA input (VAC) (B.55.e)}}$ = -1 ( $\pm 10\%$ )		
OG 1X resolver sin $(225^\circ) = \frac{8.5 \text{ (SCA output (VDC) (B.55.f) -2.5V PCM bias)}}{\text{SCA input (VAC) (B.55.f)}}$ = -1 ( $\pm 10\%$ )		
IG 1X resolver cos $(315^\circ) = \frac{8.5 \text{ (SCA output (VDC) (B.56.a) -2.5V PCM bias)}}{\text{SCA input (VAC) (B.56.a)}}$ = 1 ( $\pm 10\%$ )		
MG 1X resolver cos $(315^\circ) = \frac{8.5 \text{ (SCA output (VDC) (B.56.b) -2.5V PCM bias)}}{\text{SCA input (VAC) (B.56.b)}}$ = 1 ( $\pm 10\%$ )		

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CALCULATIONS	REJ	ACC
C.3 (cont)		
OG IX resolver cos (315°) = $\frac{8.5 \text{ (SCA output (VDC) (B.58.c) -2.5V PCM bias)}}{\text{SCA input (VAC) (B.58.e)}}$ = 1 (±10%)		
IG IX resolver sin (315°) = $\frac{8.5 \text{ (SCA output (VDC) (B.58.d) -2.5V PCM bias)}}{\text{SCA input (VAC) (B.58.e)}}$ = -1 (±10%)		
MG IX resolver sin (315°) = $\frac{8.5 \text{ (SCA output (VDC) (B.58.e) -2.5V PCM bias)}}{\text{SCA input (VAC) (B.58.e)}}$ = -1 (±10%)		
OG IX resolver sin (315°) = $\frac{8.5 \text{ (SCA output (VDC) (B.58.f) -2.5V PCM bias)}}{\text{SCA input (VAC) (B.58.g)}}$ = -1 (±10%)		
C.4 Yaw attitude error = $\frac{2.44 \text{ (SCA output (VDC) (B.89.a) -2.5V PCM bias)}}{\text{SCA input (VAC) (B.89.a)}}$ = 1 (±10%)		

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CALCULATIONS	REJ	ACC
C.4 (cont)		
Pitch attitude error = $\frac{2.44 \text{ (SCA output (VDC) (B.89.b) -2.5V PCM bias)}}{\text{SCA input (VAC) (B.89.b)}}$ = 1 (±10%)		
Roll attitude error = $\frac{2.44 \text{ (SCA output (VDC) (B.89.c) -2.5V PCM bias)}}{\text{SCA input (VAC) (B.89.c)}}$ = 1 (±10%)		
C.5 IG servo error = $\frac{\text{SCA output (VDC) (B.21 test a)}}{\text{SCA input (VAC) (B.21 test a)}}$ = 0.91 (±15%)		
MG servo error = $\frac{\text{SCA output (VDC) (B.21 test b)}}{\text{SCA input (VAC) (B.21 test b)}}$ = 0.91 (±15%)		
OG servo error = $\frac{\text{SCA output (VDC) (B.21 test c)}}{\text{SCA input (VAC) (B.21 test c)}}$ = 0.91 (±15%)		

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LEM SIGNAL CONDITIONER  
JOB FUNCTIONAL CHECKOUT

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INITIAL TDRR 32757 DS P08 8

SUBSYSTEM LEM G & N SYSTEM			
DESCRIPTION: This JDC provides a functional checkout procedure for the Signal Conditioner Module. Functional operation is evaluated by checking Signal Conditioner Module input and output data for proper correlation. Procedural methods are incorporated to cause signal generation in normally muted loops where possible in a G and N test configuration for maximum checkout capability.			
Rev.	Date	PAGES REVISED	REFERENCES
1	2	3	4
A	8-24-87	34449 All	WJT NASA PS 9015000 JDC 12614
B	8-31-87	34478 1, 2, 4-8, 10, 11, 13, 14	EA 72 - IMPORTANT
C	10-10-87	34602 12	EA 40 - See below
D	1-12-88	35421 1, 2, 4-12, 15, 16	EA 42 - INTERVAL
E	2-8-88	35561 7, 12, 13	EA 80 - TOOLS AND MATERIAL

IMPORTANT: 1. Insure that connector assembly (2003099) is connected to the LGC test connector. 2. Skip numbers preceded by an asterisk are not to be performed when testing with LEM Operational SCA, P/N 6007013. Perform all steps when testing with LEM Flight Qualification SCA, P/N 6007010.

A. PREPARATION  
NOTE: If SCA has been previously installed in system configuration prior to the performance of this JDC, proceed with step A.7. If installation is required, proceed with step A.1.

1. Perform, if applicable, JDC 12614 to downmode to OIA on mode.
2. Remove the DSKY Mounting Pedestal and DSKY from the Component Mounting Plate following detachment of ground strap and demating of cable W143 to DSKY.

VERIFICATION WITH SID REQUIRED BEFORE USE

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CAUTION: Extreme care must be exercised when mating connectors to prevent pin and socket damage.

3. Visually inspect J2 on Signal Conditioner Module (SCM) breakout box and 30J1 on SCA to insure that pins and sockets are not bent or damaged.

4. Carefully locate J2 on guide pins of 30J1; ease plug onto connector, maintaining parallelism between plug and connector as closely as possible; and engage jack screws until finger tight.

5. Turn each jack screw one turn at a time moving around connector in sequence until plug and connector are fully engaged.

6. Reinstall DSKY Mounting Pedestal with DSKY on the Component Mounting Plate, attach ground strap and mate cable W143 to DSKY.

LEM SIGNAL CONDITIONER  
JOB FUNCTIONAL CHECKOUT

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SUBSYSTEM LEM G & N SYSTEM	
ASSY	
7. Perform JDC 12614 to place the G and N system in ISS STANDBY mode with the LGC operating.	b. Press PUSH TO ADVANCE pushbutton until display indicates last two digits.
8. Connect PBA Test Point Adapter (TPA #2) direct probes to TBI-29 (H) and TBI-22 (L).	2. Set Test Selector panel to positions indicated and measure and record the following voltages on DVM.
9. Connect jumper between PROBE3 OUTPUT DIRECT jacks and DVM IN jacks on Auxiliary Input Panel.	Test Selector Panel Position Voltage
NOTE: The 28 VDC G & N Power adjusted in the following step will vary as result of heater cycling.	101 28 vdc LGC operate (GG1523X)
10. On Primary Signal Selector panel, set CROSSBAR CONTROL switches to 120 and adjust G & N Power Adjust control on Test Control panel until DVM indicates 28 (±1.0) vdc. Record DVM indication.	103 28 vdc IMU standby (GG1513X)
B. PROCEDURE	PIPA S/G OUTPUT
28 VDC STANDBY AND LGC OPERATE	3. Connect following signals to oscillograph by setting switches on Oscillograph Signal Selector panel to positions indicated:
1. Connect SCA ONE Distribution Box (GDB) stepper switch to DVM by setting CROSSBAR CONTROL switches on Primary Signal Selector panel to 271.	Switch Signal
NOTE: To position Test Selector panel, perform following operations:	CHANNEL 4 to 1 Z PIPA S/G output (GG2041V)
a. Press SIGNAL CONDITIONER LEVEL 1	CHANNEL 5 to 1 Y PIPA S/G output (GG2021V)
ENABLE pushbutton if first digit on Test Selector panel position is 1, or press SIGNAL CONDITIONER LEVEL 2 ENABLE pushbutton if first digit is 2.	CHANNEL 6 to 1 X PIPA S/G output (GG2001V)
	CHANNEL 8 to 4 SCA GDB stepper switch
	4. Insure that CH AC indicators are lighted for channels 4, 5, and 6.
	5. Set Phase Selector switch on demods to variable and zero oscillograph channels 4, 5, and 6. Set gains at 500 mv/mm following adjustments.
	6. Set gain of oscillograph channel 8 at 2 v/cm and zero adjust channel 8 for a centered trace with a 2.5 vdc bias input by

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LEM SIGNAL CONDITIONER  
JOB FUNCTIONAL CHECKOUT

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SUBSYSTEM LEM G & N SYSTEM	
ASSY	
off-setting zero line 12.5 mm to right of center line.	
7. Insure that PROCEED indicator of PROCEED/ISS OPERATE pushbutton on Test Control panel is lighted and the STANDBY requirements of JDC 12614 have been satisfied.	Table I
8. Press CHART SPEEDS 5 pushbutton on Oscillograph Control panel and set CHART DRIVE switch to cm/hr.	Test Selector Panel Position Signal
9. Obtain oscillograph record of PIPA loop closure data by performing following steps successively for each position of Test Selector panel listed in table I:	a 117 Z PIPA S/G in-phase output
a. After a minimum of 5 minutes in ISS STANDBY mode, set CHART DRIVE switch on oscillograph control panel to MM/SEC and press PROCEED/ISS OPERATE pushbutton on Test Control panel.	b 118 Y PIPA S/G in-phase output
b. Wait at least 10 seconds following PIPA loop closure when in tests a and b, then press the PROCEED/ISS STANDBY pushbutton. Following test c, allow system to remain in ISS OPERATE mode.	c 119 X PIPA S/G in-phase output
c. Following each test, set Chart Drive switch on oscillograph control panel to cm/hr. Check oscillograph recording for indications of PIPA loop closure on channel 8 correlating to the loop closure indications on channels 4, 5 and 6 respectively. Record that traces have centered after loop closure.	
10. On the Primary Signal Selector panel, set the CROSSBAR CONTROL switches to 173 and adjust the G and N Power Adjust control on the Test Control panel until the DVM indicates 28 (±0.25) vdc. Record DVM indication. Following measurement, return CROSSBAR CONTROL switches to 271.	
11. Set Test Selector panel to positions indicated and measure and record following voltages on DVM:	
NOTE: The SCA Test inhibit indicator on the Temperature Monitor Control panel will illuminate when the Test Selector Crossbar is in positions 201 and 202. Following measurements in these positions, push Signal Conditioner Level 2 Enable pushbutton and verify that the above inhibit indicator extinguishes.	

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LEM SIGNAL CONDITIONER  
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SUBSYSTEM LEM G & N SYSTEM	
ASSY	
13. Deleted	13. Deleted
14. Deleted	14. Deleted
15. Deleted	15. Deleted
16. Deleted	16. Deleted
17. Set switches on Signal Generator as follows:	17. Set switches on Signal Generator as follows:
RANGE to X.01	RANGE to X.01
FREQUENCY meter to 6.0	FREQUENCY meter to 6.0
FUNCTION to SQUARE	FUNCTION to SQUARE
DC BALANCE to midposition	DC BALANCE to midposition
AMPLITUDE to 70.	AMPLITUDE to 70.
18. Perform the following DSKY operations:	18. Perform the following DSKY operations:
a. VERB 43 ENTR	a. VERB 43 ENTR
b. VERB 33 ENTR	b. VERB 33 ENTR
19. Set FUNCTION control on PAVM to 0° and 3200 ~positions.	19. Set FUNCTION control on PAVM to 0° and 3200 ~positions.
20. Press GIMBAL SERVO TEST pushbutton on Test Selector panel. The pushbutton shall light.	20. Press GIMBAL SERVO TEST pushbutton on Test Selector panel. The pushbutton shall light.
21. Obtain stabilization loop servo error data by performing the following steps for each test listed in Table II:	21. Obtain stabilization loop servo error data by performing the following steps for each test listed in Table II:
a. Press to light TEST START pushbutton on Test Selector panel.	a. Press to light TEST START pushbutton on Test Selector panel.
NOTE: The SCA input voltage will cause the PAVM to alternately swing left and right. Determine the maximum deflection in each direction. Add the absolute values to obtain maximum meter spread.	NOTE: The SCA input voltage will cause the PAVM to alternately swing left and right. Determine the maximum deflection in each direction. Add the absolute values to obtain maximum meter spread.

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# LEM SIGNAL CONDITIONER JOB FUNCTIONAL CHECKOUT

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SUBSYSTEM LEM G & N SYSTEM

ASSY

b. Record maximum meter spread of SCA input voltages on PAVM.

NOTE: The SCA output voltage will cause the DVM to alternately indicate a high value and a low value. Determine each value. Subtract lower value from higher value to obtain maximum meter spread.

c. Record maximum meter spread of SCA output voltages on DVM.

d. Press TEST STOP pushbutton on Test Selector panel; the TEST START pushbutton shall go out.

22. Press to extinguish GIMBAL SERVO TEST pushbutton.

23. Deleted

\*24. Insure that AMPLITUDE control on Signal Generator is set to 0.

\*25. Connect jumper between PROBES OUTPUT DIRECT jacks and CH 6 DC IN jacks on Auxiliary Input panel.

\*26. Set OSCILLOGRAPH SELECTOR CHANNEL 6 switch on Oscillograph Signal Selector panel to AUX.

\*27. Insure that CH 6 DC indicator is lighted.

\*28. Zero oscillograph channel 6 and set gain at 0.3 v/cm. Set gain of channel 8 at 2 v/cm and zero adjust channel 8 for a centered trace with a 2.5 vdc bias input by off-setting zero line 12.5 mm to right of chart center line.

\*29. Set FREQUENCY meter on Signal Generator to 5 and RANGE switch to X10.

\*30. Set CHART DRIVE switch on Oscillograph Control panel to MM/SEC.

\*31. Set CROSSBAR CONTROL switches on Primary Signal Selector panel to 176 to monitor Signal Generator output on oscilloscope.

\*32. Press the Gimbal Servo Test pushbutton. The pushbutton shall light.

\*33. Obtain oscillograph trace of torque motor currents by performing the following steps for each test listed in table III.

a. Connect PRA TPA Test Points to direct probes.

\*34. Monitor and record contents of  $R_1$ ,  $R_2$  and  $R_3$  on DSKY.

\*41. In approximately 120 seconds, monitor and record the contents of  $R_1$ ,  $R_2$  and  $R_3$  again.

\*41A. Set Test Selector panel to position 145 and CROSSBAR CONTROL to 271. Record the R & D 3.5 VDC Bias indicated on the DVM.

\*42. Connect SCA input to PAVM and SCA output to DVM by connecting PRA TPA buffered probes to test points listed in table V and setting Test Selector panel to positions indicated. Record SCA in-phase input voltage on PAVM and SCA output voltage on DVM SIMULTANEOUSLY for each test.

NOTE: Due to earth rate, the voltages recorded in Table V will vary.

\*39. Within 10 to 90 seconds following step 32, a, perform the following DSKY operations:

a. VERB 21 NOUN 01 ENTR

b. 02512 ENTR

c. 00000 ENTR

d. VERB 16 NOUN 20 ENTR

\*Not applicable to LEM Operational SCA, P/N 6007013.

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# LEM SIGNAL CONDITIONER JOB FUNCTIONAL CHECKOUT

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SUBSYSTEM LEM G & N SYSTEM

ASSY

b. Set Test Selector Crossbar and Gimbal Servo Test switch as indicated.

c. Press Test START pushbutton on Test Selector panel. The pushbutton shall light.

d. Increase Signal Generator Amplitude Control until the oscilloscope indicates value listed in table III for each test. Maintain Signal Generator setting for approximately 10 seconds, then return control to 0.

e. Press Test STOP pushbutton on the Test Selector panel. The pushbutton shall extinguish.

\*34. Press the GIMBAL SERVO TEST pushbutton. The pushbutton shall extinguish. Set Oscillograph pre-amps to OFF.

\*35. Set Chart Drive switch on Oscillograph Control panel to cm/hr. Record peak-to-peak SCA input signal monitored on channel 6 and peak-to-peak SCA output signal monitored on channel 8.

\*36. Perform following DSKY operations:

a. VERB 41 NOUN 20 ENTR

b. Observe:

VERB 21 NOUN 23 Flashing

\*37. Connect jumper between PROBES OUTPUT BUFFERED jacks and PAVM IN jacks on Auxiliary Input panel.

\*38. Perform following DSKY operations:

a. VERB 21 NOUN 01 ENTR

b. 00370 ENTR

c. 18002 ENTR

d. VERB 57 ENTR

e. 00003 ENTR

f. Observe:

VERB 06 NOUN 61 Flashing

g. VERB 21 ENTR

h. 40000 ENTR

i. VERB 23 ENTR

j. SITE LATITUDE VALUE

from Table IV

k. VERB 33 ENTR

l. 00004 ENTR

m. 00001 ENTR

\*Not applicable to LEM Operational SCA, P/N 6007013.

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# LEM SIGNAL CONDITIONER JOB FUNCTIONAL CHECKOUT

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SUBSYSTEM LEM G & N SYSTEM

ASSY

a. Observe:

VERB 21 NOUN 22 Flashing

c. +00100 ENTR

p. Observe:

VERB 21 NOUN 22 Flashing

q. +00100 ENTR

r. Observe:

VERB 23 NOUN 22 Flashing

a. +00100 ENTR

\*40. Monitor and record contents of  $R_1$ ,  $R_2$  and  $R_3$  on DSKY.

\*41. In approximately 120 seconds, monitor and record the contents of  $R_1$ ,  $R_2$  and  $R_3$  again.

\*41A. Set Test Selector panel to position 145 and CROSSBAR CONTROL to 271. Record the R & D 3.5 VDC Bias indicated on the DVM.

\*42. Connect SCA input to PAVM and SCA output to DVM by connecting PRA TPA buffered probes to test points listed in table V and setting Test Selector panel to positions indicated. Record SCA in-phase input voltage on PAVM and SCA output voltage on DVM SIMULTANEOUSLY for each test.

NOTE: Due to earth rate, the voltages recorded in Table V will vary.

\*39. Within 10 to 90 seconds following step 32, a, perform the following DSKY operations:

a. VERB 21 NOUN 01 ENTR

b. 02512 ENTR

c. 00000 ENTR

d. VERB 16 NOUN 20 ENTR

\*Not applicable to LEM Operational SCA, P/N 6007013.

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# LEM SIGNAL CONDITIONER JOB FUNCTIONAL CHECKOUT

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SUBSYSTEM LEM G & N SYSTEM

ASSY

\*46. Alternately connect SCA input and SCA output to DVM by setting Test Selector panel and CROSSBAR CONTROL switches to positions listed in table VI. For each test, perform following operations:

a. Set CROSSBAR CONTROL switches to 271.

b. Set Test Selector panel to position listed in table VI and record SCA output indicated on DVM.

c. Set CROSSBAR CONTROL switches to position listed in table VI and record SCA input indicated on DVM.

\*43. Perform the following DSKY operations:

a. VERB 21 NOUN 01 ENTR

b. 02512 ENTR

c. 77776 ENTR

\*43. MG, AND OG IX RESOLVER SIN  $\pm 10$  DEGREES (GG2121, 2151, and 2181)

\*44. Perform following DSKY operations:

a. VERB 41 NOUN 20 ENTR

b. Observe:

VERB 21 NOUN 22 Flashing

c. +01000 ENTR

d. Observe:

VERB 23 NOUN 22 Flashing

e. +01000 ENTR

f. Observe:

VERB 23 NOUN 22 Flashing

g. +01000 ENTR

\*45. On DSKY, enter V16 N20 ENTR and verify that contents of  $R_1$ ,  $R_2$ , and  $R_3$  are approximately 01000.

\*Not applicable to LEM Operational SCA, P/N 6007013.

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Table V

Test	PRA TPA Test Points	Test Selector Panel Position	Signal
a	TEB-37 TEB-34	140	IG CDU fine error
b	TEB-38 TEB-34	141	MG CDU fine error
c	TEB-41 TEB-34	143	OG CDU fine error

\*43. Perform the following DSKY operations:

a. VERB 21 NOUN 01 ENTR

b. 02512 ENTR

c. 77776 ENTR

\*43. MG, AND OG IX RESOLVER SIN  $\pm 10$  DEGREES (GG2121, 2151, and 2181)

\*44. Perform following DSKY operations:

a. VERB 41 NOUN 20 ENTR

b. Observe:

VERB 21 NOUN 22 Flashing

c. +01000 ENTR

d. Observe:

VERB 23 NOUN 22 Flashing

e. +01000 ENTR

f. Observe:

VERB 23 NOUN 22 Flashing

g. +01000 ENTR

\*45. On DSKY, enter V16 N20 ENTR and verify that contents of  $R_1$ ,  $R_2$ , and  $R_3$  are approximately 01000.

\*Not applicable to LEM Operational SCA, P/N 6007013.

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Table III

Table III						
Test	Signal Generator Output On Oscilloscope	PSA TPA Test Points		Test Selector Panel Position	GIMBAL SERVO TEST Switch Position	Signal
		High	Low			
a	2V peak-to-peak	TB2-31	TB1-49	132	1	IG torque motor curr.
b	1V peak-to-peak	TB2-32	TB1-49	133	2	MG torque motor curr.
c	1V peak-to-peak	TB1-45	TB1-49	134	3	OG torque motor curr.

\*40. Monitor and record contents of  $R_1$ ,  $R_2$  and  $R_3$  on DSKY.

\*41. In approximately 120 seconds, monitor and record the contents of  $R_1$ ,  $R_2$  and  $R_3$  again.

\*41A. Set Test Selector panel to position 145 and CROSSBAR CONTROL to 271. Record the R & D 3.5 VDC Bias indicated on the DVM.

\*42. Connect SCA input to PAVM and SCA output to DVM by connecting PRA TPA buffered probes to test points listed in table V and setting Test Selector panel to positions indicated. Record SCA in-phase input voltage on PAVM and SCA output voltage on DVM SIMULTANEOUSLY for each test.

NOTE: Due to earth rate, the voltages recorded in Table V will vary.

\*39. Within 10 to 90 seconds following step 32, a, perform the following DSKY operations:

a. VERB 21 NOUN 01 ENTR

b. 02512 ENTR

c. 00000 ENTR

d. VERB 16 NOUN 20 ENTR

\*Not applicable to LEM Operational SCA, P/N 6007013.

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Table IV

Test Site	Latitude
MIT	+42.366
ACSP	+42.902
GABC	+40.748
MBC	+28.556
KSC	+28.516
NAA	+33.921

\*39. Within 10 to 90 seconds following step 32, a, perform the following DSKY operations:

a. VERB 21 NOUN 01 ENTR

b. 02512 ENTR

c. 00000 ENTR

d. VERB 16 NOUN 20 ENTR

\*Not applicable to LEM Operational SCA, P/N 6007013.

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## SUBSYSTEM LEM G &amp; N SYSTEM

ASSY

1. Observe:
- a. VERB 23 NOUN 23 Flashing
- b. +04500 ENTR
- c. VERB 16 NOUN 20 ENTR
- d. Monitor and record the contents of  $R_1$ ,  $R_2$ , and  $R_3$ .
- e. Alternately connect SCA output and SCA input to DVM for each test listed in table VII. For each test, perform following operations:

- a. Set CROSSBAR CONTROL switches to 271.
- b. Set Test Selector panel to position listed in table VII and record SCA output indicated on DVM.
- c. Immediately set CROSSBAR CONTROL to position listed in table VII and record SCA input indicated on DVM.

Test Position	CROSSBAR CONTROL Position	Signal
a	243	IG IX resolver cos (GG3113V)
b	243	MG IX resolver cos (GG3143V)
c	241	OG IX resolver cos (GG3173V)
d	144	IG IX resolver sin (GG3112V)
e	143	MG IX resolver sin (GG3142V)
f	143	OG IX resolver sin (GG3172V)

50. Perform following DSKY operations:
- a. VERB 41 NOUN 20 ENTR
- b. Observe:
- VERB 21 NOUN 23 Flashing
- c. +13500 ENTR
- d. Observe:
- VERB 23 NOUN 22 Flashing
- e. +13500 ENTR
- f. Observe:
- VERB 23 NOUN 23 Flashing
- g. +13500 ENTR
- h. VERB 16 NOUN 20 ENTR
- i. Monitor and record the contents of  $R_1$ ,  $R_2$ , and  $R_3$ .
- j. Repeat step 49.
- k. Perform following DSKY operations:

- a. VERB 41 NOUN 20 ENTR
- b. Observe:
- VERB 21 NOUN 23 Flashing
- c. +23500 ENTR
- d. Observe:
- VERB 23 NOUN 22 Flashing
- e. +23500 ENTR
- f. Observe:
- VERB 23 NOUN 23 Flashing
- g. +23500 ENTR
- h. VERB 16 NOUN 20 ENTR
- i. Monitor and record the contents of  $R_1$ ,  $R_2$ , and  $R_3$ .
- j. Repeat step 49.
- k. Perform following DSKY operations:

- a. VERB 41 NOUN 20 ENTR
- b. VERB 21 NOUN 23 Flashing
- c. +31500 ENTR

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## SUBSYSTEM LEM G &amp; N SYSTEM

ASSY

- d. Observe:
- VERB 22 NOUN 23 Flashing
- e. +31500 ENTR
- f. Observe:
- VERB 23 NOUN 23 Flashing
- g. +31500 ENTR
- h. VERB 16 NOUN 20 ENTR
- i. Monitor and record the contents of  $R_1$ ,  $R_2$ , and  $R_3$ .
- j. Repeat step 49.
- k. Perform following DSKY operations:

- a. VERB 41 NOUN 20 ENTR

- b. Observe:
- VERB 21 NOUN 23 Flashing

- c. +00000 ENTR

- d. Observe:
- VERB 22 NOUN 23 Flashing

- e. +00000 ENTR

- f. Observe:
- VERB 23 NOUN 23 Flashing

- g. +00000 ENTR

- \*RR SHAFT AND TRUNNION FINE ERROR (GG3311V and 3321V)

60. Resolver Circuit Tester Preparation (RCT)

- a. Set all decade error bridge switches and controls to OFF, minimum or zero.

- b. Connect cable W172 to GSE distribution box (GDB).

- c. Connect RCT power cable to facility 115 vac power.

- \*Not applicable to LEM Operational SCA, P/N 6007013

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## SUBSYSTEM LEM G &amp; N SYSTEM

ASSY

- \*65. Perform following DSKY operations:
- a. VERB 40 NOUN 40 ENTR
- b. VERB 21 NOUN 10 ENTR
- c. 00012 ENTR
- d. 00011 ENTR
- \*66. Monitor SCA input on PAVM by connecting P8A TPA buffered probe to TB3-33 (a) and TB3-34 (a) and connecting a jumper between PROBES OUTPUT BUFFERED JACKS and PAVM IN JAKES on Auxiliary Input Panel. Set PAVM Crossbar Control switch on Primary Signal Selector panel to AUX.

- \*67. Adjust RESOLVER ANGLE TRANSMITTER control to produce a minimum total voltage signal on PAVM. Record DVM indication.
- \*68. Adjust RESOLVER ANGLE TRANSMITTER control until the in-phase voltage on the PAVM is +720 mv. Record the DVM indication.
- \*69. Press TRUN SELECT/SET ENABLE pushbutton. Both halves of pushbutton will light.

- \*70. Connect trunnion CDU fine error output from SCA to DVM by setting Test Selector panel to 147.

- \*71. Remove P8A TPA buffered probe from TB3-33 (a) and connect to TB3-30 (a).

- \*72. Adjust RESOLVER ANGLE TRANSMITTER control until in-phase voltage on the PAVM is +720 mv. Record the DVM indication.

- \*61. Set RESOLVER ANGLE TRANSMITTER control to 0.

- \*62. Press READ MODE/SET MODE pushbutton to light SET MODE indicator.

- \*63. Press SHAFT SELECT/SET ENABLE pushbutton. Both halves of pushbutton will light.

- \*64. Connect shaft CDU fine error output from SCA to DVM by setting Test Selector panel to 146.

- NOTE: G/N CAUTION lamp on the Monitor Panel and PROG alarm lamp on the DSKY will light during performance of steps 64 through 73. Ignore the lamp indications.

- \*Not applicable to LEM Operational SCA, P/N 6007013.

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## SUBSYSTEM LEM G &amp; N SYSTEM

ASSY

- \*73. Adjust RESOLVER ANGLE TRANSMITTER control until PAVM indicates minimum total voltage signal. Record DVM indication.

- \*74. Perform following DSKY operations:
- a. VERB 21 NOUN 10 ENTR
- b. 00012 ENTR
- c. 00010 ENTR

- \*RR SHAFT AND TRUNNION IX RESOLVER SIN AND COS

- NOTE: G/N CAUTION lamp on the Monitor panel and PROG alarm lamp on the DSKY will light during performance of steps 75 through 85. Ignore the lamp indications.

- \*75. Perform following DSKY operations:
- VERB 36 ENTR
- VERB 40 NOUN 40 ENTR

- \*76. Set the following switches on the DEB and RCT control panel:

- a. DEB - reference quadrant to 0° - 90°

- b. DEB - sensitivity to fully CCW.

- c. RCT - perform step 80g.

- d. RCT - set mode to lighted.

- e. DEB - degrees to 45,000.

- f. RCT - MON COARSE to lighted.

- g. RCT - resolver angle transmitter to 45,000.

- h. DEB/RCT - adjust transmitter and sensitivity dial to achieve best null on most sensitive coarse scale.

- i. DEB - set sensitivity to fully CCW.

- j. RCT - MON FINE to lighted.

- k. DEB - degrees to 0 + 00000.

- \*Not applicable to LEM Operational SCA, P/N 6007013.

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output of following signals on DVM:

Test Selector Signal

Panel Position

129 Shaft 1X resolver sin (GG3304V)

130 Shaft 1X resolver cos (GG3305V)

83. Set RESOLVER ANGLE TRANSMITTER control to 0.

84. Set 800 REFERENCE INPUT VOLTAGE switch on Decade Error Bridge panel to OFF.

YAW, PITCH, AND ROLL ATTITUDE ERRORS (GG248V, 2218V and 2279V)

85. Perform following DSKY operations:

a. VERB 36 ENTR

b. VERB 41 NOUN 20 ENTR

c. Observe:

VERB 21 NOUN 23 Flashing

d. +00000 ENTR

e. Observe:

VERB 22 NOUN 23 Flashing

f. +00000 ENTR

g. Observe:

VERB 23 NOUN 23 Flashing

h. +00000 ENTR

NOTE: ISS WARNING lamp on Monitor panel may light during step 86. Ignore lamp indication.

86. Perform following DSKY operations:

a. VERB 21 NOUN 10 ENTR

b. 00013 ENTR

c. 00060 ENTR

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91. Press POWER OFF on Resolver Circuit Tester Control Panel.

92. Disconnect cable W172 from GDB.

Table VIII

Test	P8A TPA Test Points		Test Selector Panel Position	Signal
	High	Low		
a	TP4-43	TP4-47	114	Yaw attitude error
b	TP4-45	TP4-49	115	Pitch attitude error
c	TP4-44	TP4-48	116	Roll attitude error

C. CALCULATIONS

1. Perform following CDU fine error calculations:

a. IG CDU fine error =  $\frac{\text{SCA output (VDC)} - 2.5\text{V R\&D bias}}{2.00 \times \text{SCA input (VAC)}} = 1 (\pm 20\%)$

b. MG CDU fine error =  $\frac{\text{SCA output (VDC)} - 2.5\text{V R\&D bias}}{2.00 \times \text{SCA input (VAC)}} = 1 (\pm 20\%)$

c. OG CDU fine error =  $\frac{\text{SCA output (VDC)} - 2.5\text{V R\&D bias}}{2.00 \times \text{SCA input (VAC)}} = 1 (\pm 20\%)$

2. Perform following 1X resolver sin  $\pm 10^\circ$  degree calculations:

a. OG 1X resolver sin  $\pm 10^\circ = \frac{2 (\text{SCA output (VDC)} - 2.5\text{V PCM bias})}{\text{SCA input (VAC)}} = 1 (\pm 10\%)$

b. MG 1X resolver sin  $\pm 10^\circ = \frac{2 (\text{SCA output (VDC)} - 2.5\text{V PCM bias})}{\text{SCA input (VAC)}} = 1 (\pm 10\%)$

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c. IG 1X resolver sin  $\pm 10^\circ = \frac{2 (\text{SCA output (VDC)} - 2.5\text{V PCM bias})}{\text{SCA input (VAC)}} = 1 (\pm 10\%)$

3. Perform following 1X resolver cos and sin calculations:

a. IG 1X resolver cos =  $\frac{8.5 (\text{SCA output (VDC)} - 2.5\text{V PCM bias})}{\text{SCA input (VAC)}} = 1 (\pm 10\%)$

b. MG 1X resolver cos =  $\frac{8.5 (\text{SCA output (VDC)} - 2.5\text{V PCM bias})}{\text{SCA input (VAC)}} = 1 (\pm 10\%)$

c. OG 1X resolver cos =  $\frac{8.5 (\text{SCA output (VDC)} - 2.5\text{V PCM bias})}{\text{SCA input (VAC)}} = 1 (\pm 10\%)$

d. IG 1X resolver sin =  $\frac{8.5 (\text{SCA output (VDC)} - 2.5\text{V PCM bias})}{\text{SCA input (VAC)}} = 1 (\pm 10\%)$

e. MG 1X resolver sin =  $\frac{8.5 (\text{SCA output (VDC)} - 2.5\text{V PCM bias})}{\text{SCA input (VAC)}} = 1 (\pm 10\%)$

f. OG 1X resolver sin =  $\frac{8.5 (\text{SCA output (VDC)} - 2.5\text{V PCM bias})}{\text{SCA input (VAC)}} = 1 (\pm 10\%)$

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4. Perform following attitude error calculations:

a. Yaw attitude error =  $\frac{2.44 (\text{SCA output (VDC)} - 2.5\text{V PCM bias})}{\text{SCA input (VAC)}} = 1 (\pm 10\%)$

b. Pitch attitude error =  $\frac{2.44 (\text{SCA output (VDC)} - 2.5\text{V PCM bias})}{\text{SCA input (VAC)}} = 1 (\pm 10\%)$

c. Roll attitude error =  $\frac{2.44 (\text{SCA output (VDC)} - 2.5\text{V PCM bias})}{\text{SCA input (VAC)}} = 1 (\pm 10\%)$

5. Perform the following servo error calculations:

a. IG servo error =  $\frac{\text{SCA output (VDC)}}{\text{SCA input (VAC)}} = 0.91 (\pm 15\%)$

b. MG servo error =  $\frac{\text{SCA output (VDC)}}{\text{SCA input (VAC)}} = 0.91 (\pm 15\%)$

c. OG servo error =  $\frac{\text{SCA output (VDC)}}{\text{SCA input (VAC)}} = 0.91 (\pm 15\%)$

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APOLLO G&N  
EQUIPMENT TEST  
DATA SHEET 1 OF 18

JDC  
NO. 12620  
REV. E  
INITIAL TDRR 32757

JOB LEM SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

ASSEMBLY UNDER TEST				TEST HISTORY			
TITLE	SER. NO.	DWG	REV.	DATE	START	END	SITE / LOCATION
				TIME	START	END	TOTAL ELAPSED
MAJOR GROUND SUPPORT EQUIPMENT							
NAME	SER. NO.			CAL DATE			
NAME	SER. NO.			CAL DATE			

CONDUCTED BY		NAME / AFFILIATION		APPROVED BY		NAME / AFFILIATION	
JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ ACC	
A. 10	Bus Voltage	VDC	27.00				
B. 2	28 VDC LGC	VDC	3.9		29.00		
	Operate				4.8		
	28 VDC IMU	VDC	3.9		4.8		
	Standby						
B. 9	Loop Closure						
	Test a						
	Loop Closure						
	Test b						
	Loop Closure						
	Test c						
B. 10	Bus Voltage	VDC	27.75		28.25		
B. 11	*Cal Module Temp.	VDC	0.40		1.26		
	*RAD 2.5 VDC Bias	VDC	2.47		2.53		
	*IMU Heater	VDC	3.9		4.80		
	Current						
	PIPA Temperature	VDC	2.0		3.0		
	*TRIG Temperature	VDC	2.37		3.70		
	120 VDC Reference	VDC	2.80		4.20		

\*Parameters not available in LEM Operational SCA,  
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EQUIPMENT TEST  
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JDC  
NO. 12620  
REV. E

JOB LEM SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ ACC
B. 11 (Cont)	2.5 VDC PCM Bias	VDC	2.47		2.53	
	3200 cps, 28V Supply	VDC	4.20		4.80	
	800 cps, 28V Supply	VDC	4.20		4.80	
B. 21	IG Servo Error SCA Input (Test a)	VAC				
	IG Servo Error SCA output (Test a)	VDC				
	MG Servo Error SCA Input (Test b)	VAC				
	MG Servo Error SCA output (Test b)	VDC				
	OG Servo Error SCA Input (Test c)	VAC				
	OG Servo Error SCA output (Test c)	VDC				
B. 35.a	*IG TMC Channel 6	V/PP				
	*IG TMC Channel 8	V/PP	Channel 6 x 5.0 -15%		Channel 6 x 5.0 +15%	
B. 35.b	*MG TMC Channel 6	V/PP				
	*MG TMC Channel 8	V/PP	Channel 6 x 5.0 -15%		Channel 6 x 5.0 +15%	

\*Parameters not available in LEM Operational SCA,  
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EQUIPMENT TEST  
DATA SHEET 3 OF 18

JDC  
NO. 12620  
REV. E

JOB LEM SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ ACC
B. 35.c	*OG TMC Channel 6	V P/P				
	*OG TMC Channel 8	V P/P	Channel 6 x 2.75 -15%		Channel 6 x 2.75 +15%	
B. 40	*DSKY Row 1	Deg.				
	DSKY Row 2	Deg.				
	DSKY Row 3	Deg.				
B. 41	*DSKY Row 1	Deg.				
	DSKY Row 2	Deg.				
	DSKY Row 3	Deg.				
B. 41.a	*R & D 2.5 VDC Bias	VDC				
B. 42.a	*IG CDU Fine Error (PAVM)	VAC				
	*IG CDU Fine Error (DVM)	VDC				
B. 42.b	*MG CDU Fine Error (PAVM)	VAC				
	*MG CDU Fine Error (DVM)	VDC				
B. 42.c	*OG CDU Fine Error (PAVM)	VAC				
	*OG CDU Fine Error (DVM)	VDC				

\*Parameters not available in LEM Operational SCA,  
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APOLLO G&N  
EQUIPMENT TEST  
DATA SHEET 4 OF 18

JDC  
NO. 12620  
REV. E

JOB LEM SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ ACC
B. 46.a	*OG IX Resolver 8In ±10°	VAC				
	*OG IX Resolver 8In -10°	VDC				
B. 46.b	*MG IX Resolver 8In ±10°	VAC				
	*MG IX Resolver 8In ±10°	VDC				
B. 46.c	*IG IX Resolver 8In ±10°	VAC				
	*IG IX Resolver 8In ±10°	VDC				
B. 48	DSKY Row 1	Deg.				
	DSKY Row 2	Deg.				
	DSKY Row 3	Deg.				
B. 49.a	IG IX Resolver (45°) Cos (Test A) (TES 120)	VDC				
	IG IX Resolver (45°) Cos (Test A) (XBR 243)	VAC				
B. 49.b	MG IX Resolver (45°) Cos (Test B) (TES 121)	VDC				

\*Parameters not available in LEM Operational SCA,  
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EQUIPMENT TEST  
DATA SHEET 3 OF 18

JDC  
NO. 12620  
REV. E

JOB LEM SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ/ACC
B. 48.b (cont)	MG IX Resolver (45°) Sin (Test B) (XBR 242)	VAC				
B. 49.c	OG IX Resolver (45°) Cos (Test C) (TES 122)	VDC				
	OG IX Resolver (45°) Cos (Test C) (XBR 241)	VAC				
B. 49.d	IG IX Resolver (45°) Sin (Test D) (TES 123)	VDC				
	IG IX Resolver (45°) Sin (Test D) (XBR 144)	VAC				
B. 49.e	MG IX Resolver (45°) Sin (Test E) (TES 124)	VDC				
	MG IX Resolver (45°) Sin (Test E) (XBR 143)	VAC				
B. 49.f	OG IX Resolver (45°) Sin (Test F) (TES 125)	VDC				

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EQUIPMENT TEST  
DATA SHEET 6 OF 18

JDC  
NO. 12620  
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JOB LEM SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ/ACC
B. 49.f (cont)	OG IX Resolver (45°) Sin (Test F) (XBR 142)	VAC				
B. 51	DSKY Row 1 DSKY Row 2 DSKY Row 3	Deg. Deg. Deg.				
B. 52.a	IG IX Resolver (135°) Cos (Test A) (TES 120)	VDC				
	IG IX Resolver (135°) Cos (Test A) (XBR 243)	VAC				
B. 52.b	MG IX Resolver (135°) Cos (Test B) (TES 121)	VDC				
	MG IX Resolver (135°) Cos (Test B) (XBR 242)	VAC				
B. 52.c	OG IX Resolver (135°) Cos (Test C) (TES 122)	VDC				
	OG IX Resolver (135°) Cos (Test C) (XBR 241)	VAC				

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EQUIPMENT TEST  
DATA SHEET 7 OF 18

JDC  
NO. 12620  
REV. E

JOB LEM SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ/ACC
B. 52.d	IG IX Resolver (135°) Sin (Test D) (TES 123)	VDC				
	IG IX Resolver (135°) Sin (Test D) (XBR 144)	VAC				
B. 52.e	MG IX Resolver (135°) Sin (Test E) (TES 124)	VDC				
	MG IX Resolver (135°) Sin (Test E) (XBR 143)	VAC				
B. 52.f	OG IX Resolver (135°) Sin (Test F) (TES 125)	VDC				
	OG IX Resolver (135°) Sin (Test F) (XBR 142)	VAC				
B. 54	DSKY Row 1 DSKY Row 2 DSKY Row 3	Deg. Deg. Deg.				
B. 55.a	IG IX Resolver (225°) Cos (Test A) (TES 120)	VDC				

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EQUIPMENT TEST  
DATA SHEET 8 OF 18

JDC  
NO. 12620  
REV. E

JOB LEM SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ/ACC
B. 55.a (cont)	IG IX Resolver (225°) Cos (Test A) (XBR 243)	VAC				
B. 55.b	MG IX Resolver (225°) Cos (Test B) (TES 121)	VDC				
	MG IX Resolver (225°) Cos (Test B) (XBR 242)	VAC				
B. 55.c	OG IX Resolver (225°) Cos (Test C) (TES 122)	VDC				
	OG IX Resolver (225°) Cos (Test C) (XBR 241)	VAC				
B. 55.d	IG IX Resolver (225°) Sin (Test D) (TES 123)	VDC				
	IG IX Resolver (225°) Sin (Test D) (XBR 144)	VAC				
B. 55.e	MG IX Resolver (225°) Sin (Test E) (TES 124)	VDC				

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EQUIPMENT TEST  
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JDC  
NO. 12620  
REV. E

JOB LEM SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ ACC
B. 55.e (cont)	MG IX Resolver (225°) Sin (Test E) (XBR 143)	VAC				
B. 55.f	OG IX Resolver (225°) Sin (Test F) (TES 129)	VDC				
	OG IX Resolver (225°) Sin (Test F) (XBR 142)	VAC				
B. 57	DSKY Row 1 DSKY Row 2 DSKY Row 3					
B. 58.a	IG IX Resolver (315°) Cos (Test A) (TES 120)	VDC				
	IG IX Resolver (315°) Cos (Test A) (XBR 249)	VAC				
B. 58.b	MG IX Resolver (315°) Cos (Test B) (TES 121)	VDC				
	MG IX Resolver (315°) Cos (Test B) (XBR 242)	VAC				

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EQUIPMENT TEST  
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JDC  
NO. 12620  
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JOB LEM SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ ACC
B. 58.c	OG IX Resolver (315°) Cos (Test C) (TES 122)	VDC				
	OG IX Resolver (315°) (Test G) (XBR 241)	VAC				
B. 58.d	IG IX Resolver (315°) Sin (Test D) (TES 123)	VDC				
	IG IX Resolver (315°) Sin (Test D) (XBR 144)	VAC				
B. 58.e	MG IX Resolver (315°) Sin (Test E) (TES 124)	VDC				
	MG IX Resolver (315°) Sin (Test E) (XBR 143)	VAC				
B. 58.f	OG IX Resolver (315°) Sin (Test F) (TES 125)	VDC				
	OG IX Resolver (315°) Sin (Test F) (XBR 142)	VAC				
B. 67	*Shaft CDU Fine Error	VDC	2.45		2.55	

\*Parameters not available in LEM Operational SCA,  
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JDC  
NO. 12620  
REV. E

JOB LEM SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ ACC
B. 68	*Shaft CDU Fine Error	VDC	3.75		4.25	
B. 72	*Trunnion CDU Fine Error	VDC	3.75		4.25	
B. 73	*Trunnion CDU Fine Error	VDC	2.45		2.55	
B. 79	Trunnion IX Resolver Sin (TES 128)	VDC	4.45		4.95	
	Trunnion IX Resolver Cos (TES 131)	VDC	4.45		4.95	
B. 83	Shaft IX Resolver Sin (TES 129)	VDC	4.45		4.95	
	Shaft IX Resolver Cos (TES 130)	VDC	4.45		4.95	
B. 89.a	Yaw Attitude Error (PAVM)	VAC				
	Yaw Attitude Error (DVM) (TES 114)	VDC				
B. 89.b	Pitch Attitude Error (PAVM)	VAC				

\*Parameters not available in LEM Operational SCA,  
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JDC  
NO. 12620  
REV. E

JOB LEM SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ ACC
B. 89.b (cont)	Pitch Attitude Error (DVM) (TES 115)	VDC				
B. 89.c	Roll Attitude Error (PAVM)	VAC				
	Roll Attitude Error (DVM) (TES 116)	VDC				
CALCULATIONS						
C. 1	$\text{SCA output (VDC) - 2.5V R\&D bias} = 1 (\pm 20\%)$ $\text{IG CDU fine error} = \frac{\text{SCA output (VDC) - 2.5V R\&D bias}}{2.00 \times \text{SCA input (VAC)}} = 1 (\pm 20\%)$ $\text{MG CDU fine error} = \frac{\text{SCA output (VDC) - 2.5V R\&D bias}}{2.00 \times \text{SCA input (VAC)}} = 1 (\pm 20\%)$ $\text{OG CDU fine error} = \frac{\text{SCA output (VDC) - 2.5V R\&D bias}}{2.00 \times \text{SCA input (PAVM)}} = 1 (\pm 20\%)$					
C. 2	$\text{OG IX resolver sin } \pm 10^\circ = \frac{2 (\text{SCA output (VDC) - 2.5V R\&D bias})}{\text{SCA input (VAC)}} = 1 (\pm 10\%)$					

\*Parameters not available in LEM Operational SCA,  
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JDC  
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JOB LEM SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

CALCULATIONS	REJ	ACC
C. 2 (cont)		
*MG IX resolver sin $\pm 10^\circ = \frac{2 \text{ (SCA output (VDC) -2.5V PCM bias)}}{\text{SCA input (VAC)}}$ = 1 ( $\pm 10\%$ )		
*IG IX resolver sin $\pm 10^\circ = \frac{2 \text{ (SCA output (VDC) -2.5V PCM bias)}}{\text{SCA input (VAC)}}$ = 1 ( $\pm 10\%$ )		
C. 3		
IG IX resolver cos $(45^\circ) = \frac{8.5 \text{ (SCA output (VDC) (B. 49. a) -2.5V PCM bias)}}{\text{SCA input (VAC) (B. 49. a)}}$ = 1 ( $\pm 10\%$ )		
MG IX resolver cos $(45^\circ) = \frac{8.5 \text{ (SCA output (VDC) (B. 49. b) -2.5V PCM bias)}}{\text{SCA input (VAC) (B. 49. b)}}$ = 1 ( $\pm 10\%$ )		
OG IX resolver cos $(45^\circ) = \frac{8.5 \text{ (SCA output (VDC) (B. 49. c) -2.5V PCM bias)}}{\text{SCA input (VAC) (B. 49. c)}}$ = 1 ( $\pm 10\%$ )		

\*Parameters not available in LEM Operational SCA,  
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CALCULATIONS	REJ	ACC
C. 3 (cont)		
IG IX resolver sin $(45^\circ) = \frac{8.5 \text{ (SCA output (VDC) (B. 49. d) -2.5V PCM bias)}}{\text{SCA input (VAC) (B. 49. d)}}$ = 1 ( $\pm 10\%$ )		
MG IX resolver sin $(45^\circ) = \frac{8.5 \text{ (SCA output (VDC) (B. 49. e) -2.5V PCM bias)}}{\text{SCA input (VAC) (B. 49. e)}}$ = 1 ( $\pm 10\%$ )		
OG IX resolver sin $(45^\circ) = \frac{8.5 \text{ (SCA output (VDC) (B. 49. f) -2.5V PCM bias)}}{\text{SCA input (VAC) (B. 49. f)}}$ = 1 ( $\pm 10\%$ )		
IG IX resolver cos $(135^\circ) = \frac{8.5 \text{ (SCA output (VDC) (B. 52. a) -2.5V PCM bias)}}{\text{SCA input (VAC) (B. 52. a)}}$ = -1 ( $\pm 10\%$ )		
MG IX resolver cos $(135^\circ) = \frac{8.5 \text{ (SCA output (VDC) (B. 52. b) -2.5V PCM bias)}}{\text{SCA input (VAC) (B. 52. b)}}$ = -1 ( $\pm 10\%$ )		

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JOB LEM SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

CALCULATIONS	REJ	ACC
C. 3. (cont)		
OG IX resolver cos $(135^\circ) = \frac{8.5 \text{ (SCA output (VDC) (B. 52. c) -2.5V PCM bias)}}{\text{SCA input (VAC) (B. 52. c)}}$ = -1 ( $\pm 10\%$ )		
IG IX resolver sin $(135^\circ) = \frac{8.5 \text{ (SCA output (VDC) (B. 52. d) -2.5V PCM bias)}}{\text{SCA input (VAC) (B. 52. d)}}$ = 1 ( $\pm 10\%$ )		
MG IX resolver sin $(135^\circ) = \frac{8.5 \text{ (SCA output (VDC) (B. 52. e) -2.5V PCM bias)}}{\text{SCA input (VAC) (B. 52. e)}}$ = 1 ( $\pm 10\%$ )		
OG IX resolver sin $(135^\circ) = \frac{8.5 \text{ (SCA output (VDC) (B. 52. f) -2.5V PCM bias)}}{\text{SCA input (VAC) (B. 52. f)}}$ = 1 ( $\pm 10\%$ )		
IG IX resolver cos $(225^\circ) = \frac{8.5 \text{ (SCA output (VDC) (B. 55. a) -2.5V PCM bias)}}{\text{SCA input (VAC) (B. 55. a)}}$ = -1 ( $\pm 10\%$ )		
MG IX resolver cos $(225^\circ) = \frac{8.5 \text{ (SCA output (VDC) (B. 55. b) -2.5V PCM bias)}}{\text{SCA input (VAC) (B. 55. b)}}$ = -1 ( $\pm 10\%$ )		

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NO. 12620  
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JOB LEM SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

CALCULATIONS	REJ	ACC
C. 3 (cont)		
OG IX resolver cos $(225^\circ) = \frac{8.5 \text{ (SCA output (VDC) (B. 55. c) -2.5V PCM bias)}}{\text{SCA input (VAC) (B. 55. c)}}$ = -1 ( $\pm 10\%$ )		
IG IX resolver sin $(225^\circ) = \frac{8.5 \text{ (SCA output (VDC) (B. 55. d) -2.5V PCM bias)}}{\text{SCA input (VAC) (B. 55. d)}}$ = -1 ( $\pm 10\%$ )		
MG IX resolver sin $(225^\circ) = \frac{8.5 \text{ (SCA output (VDC) (B. 55. e) -2.5V PCM bias)}}{\text{SCA input (VAC) (B. 55. e)}}$ = -1 ( $\pm 10\%$ )		
OG IX resolver sin $(225^\circ) = \frac{8.5 \text{ (SCA output (VDC) (B. 55. f) -2.5V PCM bias)}}{\text{SCA input (VAC) (B. 55. f)}}$ = -1 ( $\pm 10\%$ )		
IG IX resolver cos $(315^\circ) = \frac{8.5 \text{ (SCA output (VDC) (B. 58. a) -2.5V PCM bias)}}{\text{SCA input (VAC) (B. 58. a)}}$ = 1 ( $\pm 10\%$ )		
MG IX resolver cos $(315^\circ) = \frac{8.5 \text{ (SCA output (VDC) (B. 58. b) -2.5V PCM bias)}}{\text{SCA input (VAC) (B. 58. b)}}$ = 1 ( $\pm 10\%$ )		

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JOB LEM SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

JDC  
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REV. E

CALCULATIONS	REJ/ACC
C.3 (cont)	
OG 1X resolver cos (315°) = $\frac{8.5 \text{ (SCA output (VDC) (B.58.c) -2.5V PCM bias)}}{\text{SCA input (VAC) (B.58.c)}}$ = 1 (±10%)	
IG 1X resolver sin (315°) = $\frac{8.5 \text{ (SCA output (VDC) (B.58.d) -2.5V PCM bias)}}{\text{SCA input (VAC) (B.58.d)}}$ = -1 (±10%)	
MG 1X resolver sin (315°) = $\frac{8.5 \text{ (SCA output (VDC) (B.58.e) -2.5V PCM bias)}}{\text{SCA input (VAC) (B.58.e)}}$ = -1 (±10%)	
OG 1X resolver sin (315°) = $\frac{8.5 \text{ (SCA output (VDC) (B.58.f) -2.5V PCM bias)}}{\text{SCA input (VAC) (B.58.f)}}$ = -1 (±10%)	
C.4	
Yaw attitude error = $\frac{2.44 \text{ (SCA output (VDC) (B.59.a) -2.5V PCM bias)}}{\text{SCA input (VAC) (B.59.a)}}$ = 1 (±10%)	

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CALCULATIONS	REJ/ACC
C.4 (cont)	
Pitch attitude error = $\frac{2.44 \text{ (SCA output (VDC) (B.59.b) -2.5V PCM bias)}}{\text{SCA input (VAC) (B.59.b)}}$ = 1 (±10%)	
Roll attitude error = $\frac{2.44 \text{ (SCA output (VDC) (B.59.c) -2.5V PCM bias)}}{\text{SCA input (VAC) (B.59.c)}}$ = 1 (±10%)	
C.5	
IG servo error = $\frac{\text{SCA output (VDC) (B.21 test a)}}{\text{SCA input (VAC) (B.21 test a)}}$ = 0.91 (±15%)	
MG servo error = $\frac{\text{SCA output (VDC) (B.21 test b)}}{\text{SCA input (VAC) (B.21 test b)}}$ = 0.91 (±15%)	
OG servo error = $\frac{\text{SCA output (VDC) (B.21 test c)}}{\text{SCA input (VAC) (B.21 test c)}}$ = 0.91 (±15%)	

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SUBSYSTEM LEM G & N SYSTEM				ASSY
DESCRIPTION: This JDC provides a functional checkout procedure for the Signal Conditioner Assembly. Functional operation is evaluated by checking Signal Conditioner Assembly input and output data for proper correlation. Procedural methods are incorporated to cause signal generation in normally muted loops where possible in a G and N test configuration for maximum checkout capability.				
Rev	Date	NO.	PAGES REVISED	REFERENCES
A	2-24-67	3449	ALL	PG 6015000
B	8-31-67	34478	1, 2, 4, 8, 10, 11, 13, 12, 15-17	JDC 12614
C	10-10-67	34802	12	IMPORTANT
D	1-12-68	35421	1, 2, 4, 12, 15, 16, 18	See below
E	2-6-68	35561	7, 12, 13	INTERVAL
F	3-28-68	35977	1-3, 5-8, 4, 5, 12, 13	TOOLS AND MATERIAL
			10-13	

**IMPORTANT:** 1. Insure that connector assembly (2003089) is connected to the LGC test connector. 2. Step numbers preceded by an asterisk are not to be performed when testing with LEM Operational SCA, P/N 6007013. Perform all steps when testing with LEM Flight Qualification SCA, P/N 6007010.

#### A. PREPARATION

- NOTE: If SCA has been previously installed in system configuration prior to the performance of this JDC, proceed with step A. 7. If installation is required, proceed with step A. 1.
- Perform, if applicable, JDC 12614 to downmode to OIA on mode.
  - Remove the DSKY Mounting Pedestal and DSKY from the Component Mounting Plate following detachment of ground strap and detaching of cable W143 to DSKY.

VERIFICATION WITH SID REQUIRED BEFORE USE

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**CAUTION:** Extreme care must be exercised when mating connectors to prevent pin and socket damage.

- Visually inspect J2 on Signal Conditioner Module (SCM) breakout box and 90J1 on SCA to insure that pins and sockets are not bent or damaged.
- Carefully locate J2 on guide pins of 30J1; ease plug onto connector, maintaining parallelism between plug and connector as closely as possible; and engage jackscrews until finger tight.
- Turn each jackscrew one turn at a time moving around connector in sequence until plug and connector are fully engaged.
- Reinstall DSKY Mounting Pedestal with DSKY on the Component Mounting Plate, attach ground strap and mate cable W143 to DSKY.

SUBSYSTEM LEM G & N SYSTEM				ASSY
DESCRIPTION: This JDC provides a functional checkout procedure for the Signal Conditioner Assembly. Functional operation is evaluated by checking Signal Conditioner Assembly input and output data for proper correlation. Procedural methods are incorporated to cause signal generation in normally muted loops where possible in a G and N test configuration for maximum checkout capability.				
Test	Test Selector Panel Position	Signal	Panel Position	
a	117	Z PIPA S/G in-phase output	*135	Cal. Mod. Temperature (GG60307)
b	118	Y PIPA S/G in-phase output	*145	R & D 2.5 vdc bias (GG1111V)
c	119	X PIPA S/G in-phase output	*150	IMU Heater Current (GG12302X)

10. On the Primary Signal Selector panel, set the CROSBAR CONTROL switches to 173 and adjust the G & N POWER ADJUST control on the Test Control panel until the DVM indicates 28 (±0.25) vdc. Record DVM indication. Following measurement, return CROSBAR CONTROL switches to 271.

11. Set Test Selector panel to positions indicated and measure and record following voltages on DVM:

NOTE: The SCA TEST TMC INHIBIT indicator on the Temperature Monitor Control panel will illuminate when the Test Selector CROSBAR is in positions 301 and 202. Following measurements in these positions, push SIGNAL CONDITIONER LEVEL 2 ENABLE pushbutton and verify that the above inhibit indicator extinguishes.

- Wait at least 10 seconds following PIPA loop closure when in tests a and b, then press the PROCEED/ISS STANDBY pushbutton. Following test c, allow system to remain in ISS OPERATE mode.
- Following each test, set Chart Drive switch on oscillograph control panel to cm/hr. Check oscillograph recording for indications of PIPA loop closure on channel 8 correlating to the loop closure indications on channels 4, 5 and 6 respectively. Record that traces have centered after loop closure.

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SUBSYSTEM LEM G & N SYSTEM				ASSY
DESCRIPTION: This JDC provides a functional checkout procedure for the Signal Conditioner Assembly. Functional operation is evaluated by checking Signal Conditioner Assembly input and output data for proper correlation. Procedural methods are incorporated to cause signal generation in normally muted loops where possible in a G and N test configuration for maximum checkout capability.				
7.	Perform JDC 12614 to place the G and N system in ISS STANDBY mode with the LGC operating.			b. Press PUSH TO ADVANCE pushbutton until display indicates last two digits.
8.	Connect P8A Test Point Adapter (TPA #2) direct probes to T81-29 (hi) and T85-22 (lo).			2. Set Test Selector panel to positions indicated and measure and record the following voltages on DVM.
9.	Connect jumper between PROBES OUTPUT DIRECT jacks and DVM IN jacks on Auxiliary Input Panel.			Test Selector Panel Position
	NOTE: The 28 VDC G & N Power adjusted in the following step will vary as result of heater cycling.			101
				102

10. On Primary Signal Selector panel, set CROSBAR CONTROL switches to 180 and adjust G & N POWER ADJUST control on Test Control panel until DVM indicates 28 (±1.0) vdc. Record DVM indication.

B. PROCEDURE

28 VDC STANDBY AND LGC OPERATE

- Connect SCA GSE Distribution Box (GDB) stepper switch to DVM by setting CROSBAR CONTROL switches on Primary Signal Selector panel to 271.

NOTE: To position Test Selector panel, perform following operations:

- Press SIGNAL CONDITIONER LEVEL 1 ENABLE pushbutton if first digit on Test Selector panel position is 1, or press SIGNAL CONDITIONER LEVEL 2 ENABLE pushbutton if first digit is 2.

13. Deleted

14. Deleted

15. Deleted

16. Deleted

17. Set switches on Signal Generator as follows:

RANGE to X.01

FREQUENCY meter to 6.0

FUNCTION to SQUARE

DC BALANCE to midposition

AMPLITUDE to 70.

18. Perform the following DSKY operations:

- VERB 43 ENTR
- VERB 33 ENTR

19. Set FUNCTION control on PAVM to 0° and 3200 ~ positions.

20. Press GIMBAL SERVO TEST pushbutton on Test Selector panel. The pushbutton shall light.

21. Obtain stabilization loop servo error data by performing the following steps for each test listed in Table II:

- Press to light TEST START pushbutton on Test Selector panel.

NOTE: The SCA input voltage will cause the PAVM to alternately swing left and right. Determine the maximum deflection in each direction. Add the absolute values to obtain maximum meter spread.

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SUBSYSTEM LEM G & N SYSTEM				ASSY
DESCRIPTION: This JDC provides a functional checkout procedure for the Signal Conditioner Assembly. Functional operation is evaluated by checking Signal Conditioner Assembly input and output data for proper correlation. Procedural methods are incorporated to cause signal generation in normally muted loops where possible in a G and N test configuration for maximum checkout capability.				
13.	Deleted			
14.	Deleted			
15.	Deleted			
16.	Deleted			
17.	Set switches on Signal Generator as follows:			
	RANGE to X.01			
	FREQUENCY meter to 6.0			
	FUNCTION to SQUARE			
	DC BALANCE to midposition			
	AMPLITUDE to 70.			
18.	Perform the following DSKY operations:			
	a. VERB 43 ENTR			
	b. VERB 33 ENTR			
19.	Set FUNCTION control on PAVM to 0° and 3200 ~ positions.			
20.	Press GIMBAL SERVO TEST pushbutton on Test Selector panel. The pushbutton shall light.			
21.	Obtain stabilization loop servo error data by performing the following steps for each test listed in Table II:			
	a. Press to light TEST START pushbutton on Test Selector panel.			
	NOTE: The SCA input voltage will cause the PAVM to alternately swing left and right. Determine the maximum deflection in each direction. Add the absolute values to obtain maximum meter spread.			

SUBSYSTEM LEM G & N SYSTEM

ASSY

b. Record maximum motor spread of SCA input voltages on PAVM.

NOTE: The SCA output voltage will cause the DVM to alternately indicate a high value and a low value. Determine each value. Subtract lower value from higher value to obtain maximum motor spread.

c. Record maximum motor spread of SCA output voltages on DVM.

d. Press TEST STOP pushbutton on Test Selector panel; the TEST START pushbutton shall go out.

22. Press to extinguish GIMBAL SERVO TEST pushbutton.

23. Deleted

Table II			
Test	Gimbal Servo Test Switch Position (CROSSBAR to 271)	Signal	CROSSBAR CONTROL Position (PAVM)
a	1	IG servo error	135
b	2	MG servo error	134
c	3	OG servo error	133

\*Not applicable to LEM Operational SCA, P/N 6007013.

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ASSY

b. Set Test Selector CROSSBAR and GIMBAL SERVO TEST switches indicated.

c. Press TEST START pushbutton on Test Selector panel. The pushbutton shall light.

d. Increase Signal Generator AMPLITUDE control until the oscilloscope indicates value listed in table III for each test. Maintain Signal Generator setting for approximately 10 seconds, then return control to 0.

e. Press TEST STOP pushbutton on the Test Selector panel. The pushbutton shall extinguish.

\*34. Press the GIMBAL SERVO TEST pushbutton. The pushbutton shall extinguish. Set Oscilloscope pre-amp to OFF.

\*35. Set CHART DRIVE switch on Oscilloscope Control panel to CM/HR. Record peak-to-peak SCA input signal monitored on channel 6 and peak-to-peak SCA output signal monitored on channel 8.

\*IG, MG, AND OG CDU FINE ERRORS (GG2220, 2250 and 2280)

\*36. Perform following DSKY operations:

a. VERB 41 NOUN 20 ENTR

b. Observe:

VERB 21 NOUN 22 Flashing

c. -00000

d. Observe:

VERB 22 NOUN 22 Flashing

e. -00000

f. Observe:

VERB 23 NOUN 22 Flashing

g. -00000

\*37. Connect jumper between PROBES OUTPUT BUFFERED jacks and PAVM IN jacks on Auxiliary Input panel.

\*38. Perform following DSKY operations:

a. VERB 21 NOUN 01 ENTR

b. 00370

c. 10002

d. VERB 57

e. 00003

f. Observe:

VERB 06 NOUN 01 Flashing

g. VERB 21

h. -00000

i. VERB 22

j. SITE LATITUDE VALUE

from Table IV

k. VERB 33

l. 00004

m. 00001

\*Not applicable to LEM Operational SCA, P/N 6007013.

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SUBSYSTEM LEM G & N SYSTEM

ASSY

Table III			
Test	Signal Generator Output On Oscilloscope	PSA TPA Test Points	
		High	Low
a	2V peak-to-peak	TB2-31	TB1-49
b	1V peak-to-peak	TB2-32	TB1-49
c	1V peak-to-peak	TB1-45	TB1-49

a. Observe:

VERB 21 NOUN 22 Flashing

b. +00100

c. Observe:

VERB 22 NOUN 22 Flashing

d. +00100

e. Observe:

VERB 23 NOUN 22 Flashing

f. +00100

Table IV

Test Site	Latitude
MIT	+42.366
ACSP	+42.902
GAEC	+40.748
MSC	+29.556
KSC	+28.516
NAA	+33.921

\*39. Within 10 to 90 seconds following step

\*38. a. perform the following DSKY operations:

a. VERB 21 NOUN 01 ENTR

b. 02512

c. 00000

d. VERB 16 NOUN 20 ENTR

\*40. Monitor and record contents of  $R_1$ ,  $R_2$  and  $R_3$  on DSKY.

\*41. In approximately 120 seconds, monitor and record the contents of  $R_1$ ,  $R_2$  and  $R_3$  again.

\*41A. Set Test Selector panel to position 145 and CROSSBAR CONTROL to 271. Record the R & D 2.5 VDC Bias indicated on the DVM.

\*42. Connect SCA input to PAVM and SCA output to DVM by connecting PSA TPA buffered probes to test points listed in table V and setting Test Selector panel to positions indicated. Record SCA in-phase input voltage on PAVM and SCA output voltage on DVM SIMULTANEOUSLY for each test.

NOTE: Due to earth rate, the voltages recorded in Table V will vary.

\*Not applicable to LEM Operational SCA, P/N 6007013.

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Chg. 7-66

SUBSYSTEM LEM G & N SYSTEM

ASSY

Table V			
Test	PSA TPA Test Points	Test Selector Panel Position	
		High	Low
a	TB3-37	TB3-34	140
b	TB3-38	TB3-34	141
c	TB3-41	TB3-34	143

\*43. Perform the following DSKY operations:

a. VERB 21 NOUN 01 ENTR

b. 02512

c. 77776

\*IG, MG, AND OG LX RESOLVER SIN  $\pm 10$  DEGREES (GG2121, 2151, and 2181)

\*44. Perform following DSKY operations:

a. VERB 41 NOUN 20 ENTR

b. Observe:

VERB 21 NOUN 22 Flashing

c. +01000

d. Observe:

VERB 22 NOUN 22 Flashing

e. +01000

f. Observe:

VERB 23 NOUN 22 Flashing

g. +01000

\*45. On DSKY, enter V16 N20 ENTR and verify that contents of  $R_1$ ,  $R_2$ , and  $R_3$  are approximately 01000.

\*46. Alternately connect SCA input and SCA output to DVM by setting Test Selector panel and CROSSBAR CONTROL switches to positions listed in table VI. For each test, perform following operations:

a. Set CROSSBAR CONTROL switches to 271.

b. Set Test Selector panel to position listed in table VI and record SCA output indicated on DVM.

c. Set CROSSBAR CONTROL switches to position listed in table VI and record SCA input indicated on DVM.

Table VI

Test	CROSSBAR CONTROL Position	Test Selector Panel Position	Signal
a	142	203	OG LX resolver sin $\pm 10^\circ$
b	144	204	IG LX resolver sin $\pm 10^\circ$
c	143	205	MG LX resolver sin $\pm 10^\circ$

IG, MG, AND OG LX RESOLVER SIN AND COS

\*47. Perform following DSKY operations:

a. VERB 41 NOUN 20 ENTR

b. Observe:

VERB 21 NOUN 22 Flashing

c. +04500

d. Observe:

VERB 22 NOUN 22 Flashing

e. +04500

\*Not applicable to LEM Operational SCA, P/N 6007013.

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output of following signals on DVM:

Test Selector Signal

Panel Position

129 Shaft 1X resolver sin (GG3304V)

130 Shaft 1X resolver cos (GG3305V)

83. Set RESOLVER ANGLE TRANSMITTER control to 0.

84. Set 800~ REFERENCE INPUT VOLTAGE switch on Decade Error Bridge panel to OFF.

YAW, PITCH, AND ROLL ATTITUDE ERRORS (GG2249V, 2219V and 2279V)

85. Perform following DSKY operations:

a. VERB 36 ENTR

b. VERB 41 NOUN 20 ENTR

c. Observe:

VERB 21 NOUN 22 Flashing

d. +00000 ENTR

e. Observe:

VERB 22 NOUN 22 Flashing

f. +00000 ENTR

g. Observe:

VERB 23 NOUN 22 Flashing

h. +00000 ENTR

NOTE: ISS WARNING lamp on Monitor panel may light during step 86. Ignore lamp indication.

86. Perform following DSKY operations:

a. VERB 21 NOUN 10 ENTR

b. 00012 ENTR

c. 00060 ENTR

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91. Press POWER OFF on Resolver Circuit Tester Control Panel.

92. Disconnect cable W172 from GDB.

Table VIII

Test	PSA TPA Test Points		Test Selector Panel Position	Signal
	High	Low		
a	TB4-43	TB4-47	114	Yaw attitude error
b	TB4-45	TB4-49	115	Pitch attitude error
c	TB4-44	TB4-48	116	Roll attitude error

### C. CALCULATIONS

1. Perform following CDU fine error calculations:

a. IG CDU fine error =  $\frac{\text{SCA output (VDC)} - 2.5\text{V R\&D bias}}{2.00 \times \text{SCA input (VAC)}} = 1 (\pm 20\%)$

b. MG CDU fine error =  $\frac{\text{SCA output (VDC)} - 2.5\text{V R\&D bias}}{2.00 \times \text{SCA input (VAC)}} = 1 (\pm 20\%)$

c. OG CDU fine error =  $\frac{\text{SCA output (VDC)} - 2.5\text{V R\&D bias}}{2.00 \times \text{SCA input (VAC)}} = 1 (\pm 20\%)$

2. Perform following 1X resolver sin  $\pm 10^\circ$  degree calculations:

a. OG 1X resolver sin  $\pm 10^\circ = \frac{2 (\text{SCA output (VDC)} - 2.5\text{V PCM bias})}{\text{SCA input (VAC)}} = 1 (\pm 10\%)$

b. MG 1X resolver sin  $\pm 10^\circ = \frac{2 (\text{SCA output (VDC)} - 2.5\text{V PCM bias})}{\text{SCA input (VAC)}} = 1 (\pm 10\%)$

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c. IG 1X resolver sin  $\pm 10^\circ = \frac{2 (\text{SCA output (VDC)} - 2.5\text{V PCM bias})}{\text{SCA input (VAC)}} = 1 (\pm 10\%)$

3. Perform following 1X resolver cos and sin calculations:

a. IG 1X resolver cos =  $\frac{8.5 (\text{SCA output (VDC)} - 2.5\text{V PCM bias})}{\text{SCA input (VAC)}} = 1 (\pm 10\%)$

b. MG 1X resolver cos =  $\frac{8.5 (\text{SCA output (VDC)} - 2.5\text{V PCM bias})}{\text{SCA input (VAC)}} = 1 (\pm 10\%)$

c. OG 1X resolver cos =  $\frac{8.5 (\text{SCA output (VDC)} - 2.5\text{V PCM bias})}{\text{SCA input (VAC)}} = 1 (\pm 10\%)$

d. IG 1X resolver sin =  $\frac{8.5 (\text{SCA output (VDC)} - 2.5\text{V PCM bias})}{\text{SCA input (VAC)}} = 1 (\pm 10\%)$

e. MG 1X resolver sin =  $\frac{8.5 (\text{SCA output (VDC)} - 2.5\text{V PCM bias})}{\text{SCA input (VAC)}} = 1 (\pm 10\%)$

f. OG 1X resolver sin =  $\frac{8.5 (\text{SCA output (VDC)} - 2.5\text{V PCM bias})}{\text{SCA input (VAC)}} = 1 (\pm 10\%)$

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4. Perform following attitude error calculations:

a. Yaw attitude error =  $\frac{2.44 (\text{SCA output (VDC)} - 2.5\text{V PCM bias})}{\text{SCA input (VAC)}} = 1 (\pm 10\%)$

b. Pitch attitude error =  $\frac{2.44 (\text{SCA output (VDC)} - 2.5\text{V PCM bias})}{\text{SCA input (VAC)}} = 1 (\pm 10\%)$

c. Roll attitude error =  $\frac{2.44 (\text{SCA output (VDC)} - 2.5\text{V PCM bias})}{\text{SCA input (VAC)}} = 1 (\pm 10\%)$

5. Perform the following servo error calculations:

a. IG servo error =  $\frac{\text{SCA output (VDC)}}{\text{SCA input (VAC)}} = 0.91 (\pm 15\%)$

b. MG servo error =  $\frac{\text{SCA output (VDC)}}{\text{SCA input (VAC)}} = 0.91 (\pm 15\%)$

c. OG servo error =  $\frac{\text{SCA output (VDC)}}{\text{SCA input (VAC)}} = 0.91 (\pm 15\%)$

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APOLLO 68N  
EQUIPMENT TEST  
DATA SHEET 1 OF 18

JDC  
NO. 12620  
REV. F  
INITIAL TDRR 32717

JOB LEM SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

ASSEMBLY UNDER TEST		TEST HISTORY	
TITLE	DATE	START	END
SER. NO.	DWG	REV.	SITE / LOCATOR
MAJOR GROUND SUPPORT EQUIPMENT		TIME	END
		START	TOTAL ELAPSED
NAME	SER. NO.		
NAME	SER. NO.		
CONDUCTED BY		APPROVED BY	
NAME/AFFILIATION		NAME/AFFILIATION	

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ ACC
A. 10	Bus Voltage	VDC	27.00		29.00	
B. 2	28 VDC LGC Operate	VDC	3.9		4.8	
	28 VDC IMU Standby	VDC	3.9		4.8	
B. 9	Loop Closure Test a					
	Loop Closure Test b					
	Loop Closure Test c					
B. 10	Bus Voltage	VDC	27.75		28.25	
B. 11	*Cal Module Temp.	VDC	0.40		1.26	
	*RAD 2.5 VDC Bias	VDC	2.47		2.53	
	*IMU Heater Current	VDC	3.9		4.80	
	PIPA Temperature	VDC	2.0		3.0	
	*IRIG Temperature	VDC	2.37		3.70	
	120 VDC Reference	VDC	2.80		4.20	

\*Parameters not available in LEM Operational SCA,  
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APOLLO 68N  
EQUIPMENT TEST  
DATA SHEET 2 OF 18

JDC  
NO. 12620  
REV. F

JOB LEM SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ ACC
B. 11 (Cont)	2.5 VDC PCM Bias	VDC	2.47		2.53	
	3200 cps, 28V Supply	VDC	4.20		4.80	
	800 cps, 28V Supply	VDC	4.20		4.80	
B. 21	IG Servo Error SCA input (Test a)	VAC				
	IG Servo Error SCA output (Test a)	VDC				
	MG Servo Error SCA input (Test b)	VAC				
	MG Servo Error SCA output (Test b)	VDC				
	OG Servo Error SCA input (Test c)	VAC				
	OG Servo Error SCA output (Test c)	VDC				
B. 35.a	*IG TMC Channel 6	V/PP				
	*IG TMC Channel 8	V/PP	Channel 6 x 5.0 -15%		Channel 8 x 5.0 -15%	
B. 35.b	*MG TMC Channel 6	V/PP				
	*MG TMC Channel 8	V/PP	Channel 6 x 5.0 -15%		Channel 8 x 5.0 -15%	

\*Parameters not available in LEM Operational SCA,  
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APOLLO 68N  
EQUIPMENT TEST  
DATA SHEET 3 OF 18

JDC  
NO. 12620  
REV. F

JOB LEM SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ ACC
B. 35.c	*OG TMC Channel 6	V P/P				
	*OG TMC Channel 8	V P/P	Channel 6 x 2.75 -15%		Channel 8 x 2.75 +15%	
B. 40	*DSKY Row 1	Deg.				
	DSKY Row 2	Deg.				
	DSKY Row 3	Deg.				
B. 41	*DSKY Row 1	Deg.				
	DSKY Row 2	Deg.				
	DSKY Row 3	Deg.				
B. 41.a	*R & D 2.5 VDC Bias	VDC				
B. 42.a	*IG CDU Fine Error (PAVM)	VAC				
	*IG CDU Fine Error (DVM)	VDC				
B. 42.b	*MG CDU Fine Error (PAVM)	VAC				
	*MG CDU Fine Error (DVM)	VDC				
B. 42.c	*OG CDU Fine Error (PAVM)	VAC				
	*OG CDU Fine Error (DVM)	VDC				

\*Parameters not available in LEM Operational SCA,  
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APOLLO 68N  
EQUIPMENT TEST  
DATA SHEET 4 OF 18

JDC  
NO. 12620  
REV. F

JOB LEM SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ ACC
B. 46.a	*OG IX Resolver Sin $\pm 10^\circ$ (Test A) (TES 203)	VDC				
	*OG IX Resolver Sin $\pm 10^\circ$ (Test A) (XBR 142)	VAC				
B. 46.b	*IG IX Resolver Sin $\pm 10^\circ$ (Test B) (TES 204)	VDC				
	*IG IX Resolver Sin $\pm 10^\circ$ (Test B) (XBR 144)	VAC				
B. 46.c	*MG IX Resolver Sin $\pm 10^\circ$ (Test C) (TES 205)	VDC				
	*MG IX Resolver Sin $\pm 10^\circ$ (Test C) (XBR 145)	VAC				
B. 48	DSKY Row 1	Deg.				
	DSKY Row 2	Deg.				
	DSKY Row 3	Deg.				
B. 49.a	IG IX Resolver (45°) Cos (Test A) (TES 120)	VDC				
	IG IX Resolver (45°) Cos (Test A) (XBR 243)	VAC				

\*Parameters not available in LEM Operational SCA,  
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APOLLO G&N  
EQUIPMENT TEST  
DATA SHEET 5 OF 18

JDC  
NO. 12620  
REV. F

JOB LEM SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ ACC
B. 49. b	MG IX Resolver (45°) Cos (Test B) (TES 121)	VDC				
	MG IX Resolver (45°) Cos (Test B) (XBR 242)	VAC				
	OG IX Resolver (45°) Cos (Test C) (TES 122)	VDC				
B. 49. c	OG IX Resolver (45°) Cos (Test C) (XBR 241)	VAC				
	IG IX Resolver (45°) Sin (Test D) (TES 123)	VDC				
	IG IX Resolver (45°) Sin (Test D) (XBR 144)	VAC				
B. 49. d	MG IX Resolver (45°) Sin (Test E) (TES 124)	VDC				
	MG IX Resolver (45°) Sin (Test E) (XBR 145)	VAC				
	OG IX Resolver (45°) Sin (Test F) (TES 125)	VDC				

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APOLLO G&N  
EQUIPMENT TEST  
DATA SHEET 5 OF 18

JDC  
NO. 12620  
REV. F

JOB LEM SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ ACC
B. 49. f (cont)	OG IX Resolver (45°) Sin (Test F) (XBR 142)	VAC				
	DSKY Row 1 DSKY Row 2 DSKY Row 3	Deg. Deg. Deg.				
B. 52. a	IG IX Resolver (135°) Cos (Test A) (TES 120)	VDC				
	IG IX Resolver (135°) Cos (Test A) (XBR 243)	VAC				
	MG IX Resolver (135°) Cos (Test B) (TES 121)	VDC				
B. 52. b	MG IX Resolver (135°) Cos (Test B) (XBR 242)	VAC				
	OG IX Resolver (135°) Cos (Test C) (TES 122)	VDC				
	OG IX Resolver (135°) Cos (Test C) (XBR 241)	VAC				

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EQUIPMENT TEST  
DATA SHEET 7 OF 18

JDC  
NO. 12620  
REV. F

JOB LEM SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ ACC
B. 53. d	IG IX Resolver (135°) Sin (Test D) (TES 123)	VDC				
	IG IX Resolver (135°) Sin (Test D) (XBR 144)	VAC				
	MG IX Resolver (135°) Sin (Test E) (TES 124)	VDC				
B. 53. e	MG IX Resolver (135°) Sin (Test E) (XBR 144)	VAC				
	OG IX Resolver (135°) Sin (Test F) (TES 125)	VDC				
	OG IX Resolver (135°) Sin (Test F) (XBR 142)	VAC				
B. 54	DSKY Row 1 DSKY Row 2 DSKY Row 3	Deg. Deg. Deg.				
	IG IX Resolver (225°) Cos (Test A) (TES 120)	VDC				

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EQUIPMENT TEST  
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JDC  
NO. 12620  
REV. F

JOB LEM SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ ACC
B. 55. a (cont)	IG IX Resolver (225°) Cos (Test A) (XBR 243)	VAC				
	MG IX Resolver (225°) Cos (Test B) (TES 121)	VDC				
	MG IX Resolver (225°) Cos (Test B) (XBR 242)	VAC				
B. 55. c	OG IX Resolver (225°) Cos (Test C) (TES 122)	VDC				
	OG IX Resolver (225°) Cos (Test C) (XBR 241)	VAC				
	IG IX Resolver (225°) Sin (Test D) (TES 123)	VDC				
B. 55. d	IG IX Resolver (225°) Sin (Test D) (XBR 144)	VAC				
	MG IX Resolver (225°) Sin (Test E) (TES 124)	VDC				

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EQUIPMENT TEST  
DATA SHEET 9 OF 18

JDC  
NO. 12620  
REV. F

JOB LEM SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ/ACC
B. 55. e (cont)	MG IX Resolver (225°) Sin (Test E) (XBR 143)	VAC				
B. 55. f	OG IX Resolver (225°) Sin (Test F) (TES 125)	VDC				
	OG IX Resolver (225°) Sin (Test F) (XBR 142)	VAC				
B. 57	DSKY Row 1					
	DSKY Row 2					
	DSKY Row 3					
B. 56. a	IG IX Resolver (315°) Cos (Test A) (TES 120)	VDC				
	IG IX Resolver (315°) Cos (Test A) (XBR 243)	VAC				
B. 56. b	MG IX Resolver (315°) Cos (Test B) (TES 121)	VDC				
	MG IX Resolver (315°) Cos (Test B) (XBR 242)	VAC				

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EQUIPMENT TEST  
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JDC  
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JOB LEM SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ/ACC
B. 58. c	OG IX Resolver (315°) Cos (Test C) (TES 122)	VDC				
	OG IX Resolver (315°) (Test C) (XBR 241)	VAC				
B. 58. d	IG IX Resolver (315°) Sin (Test D) (TES 123)	VDC				
	IG IX Resolver (315°) Sin (Test D) (XBR 144)	VAC				
B. 58. e	MG IX Resolver (315°) Sin (Test E) (TES 124)	VDC				
	MG IX Resolver (315°) Sin (Test E) (XBR 143)	VAC				
B. 58. f	OG IX Resolver (315°) Sin (Test F) (TES 125)	VDC				
	OG IX Resolver (315°) Sin (Test F) (XBR 142)	VAC				
B. 67	*Shaft CDU Fine Error	VDC	2.45		2.55	

\*Parameters not available in LEM Operational SCA,  
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EQUIPMENT TEST  
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JDC  
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REV. F

JOB LEM SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ/ACC
B. 68	*Shaft CDU Fine Error	VDC	3.75		4.25	
B. 72	*Trunnion CDU Fine Error	VDC	3.75		4.25	
B. 73	*Trunnion CDU Fine Error	VDC	2.45		2.55	
B. 79	Trunnion IX Resolver Sin (TES 129)	VDC	4.45		4.95	
	Trunnion IX Resolver Cos (TES 131)	VDC	4.45		4.95	
B. 82	Shaft IX Resolver Sin (TES 129)	VDC	4.45		4.95	
	Shaft IX Resolver Cos (TES 130)	VDC	4.45		4.95	
B. 88. a	Yaw Attitude Error (PAVM)	VAC				
	Yaw Attitude Error (DVM) (TES 114)	VDC				
B. 89. b	Pitch Attitude Error (PAVM)	VAC				

\*Parameters not available in LEM Operational SCA,  
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EQUIPMENT TEST  
DATA SHEET 12 OF 18

JDC  
NO. 12620  
REV. F

JOB LEM SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ/ACC
B. 89. b (cont)	Pitch Attitude Error (DVM) (TES 119)	VDC				
B. 89. c	Roll Attitude Error (PAVM)	VAC				
	Roll Attitude Error (DVM) (TES 116)	VDC				
CALCULATIONS						
C. 1	$\text{IG CDU fine error} = \frac{\text{SCA output (VDC) (B. 42. a) - 2.5V R\&D bias}}{2.00 \times \text{SCA input (VAC) (B. 42. a)}} = 1 \text{ (±20\%)}$					
	$\text{MG CDU fine error} = \frac{\text{SCA output (VDC) (B. 42. b) - 2.5V R\&D bias}}{2.00 \times \text{SCA input (VAC) (B. 42. b)}} = 1 \text{ (±20\%)}$					
	$\text{OG CDU fine error} = \frac{\text{SCA output (VDC) (B. 42. c) - 2.5V R\&D bias}}{2.00 \times \text{SCA input (VAC) (B. 42. c)}} = 1 \text{ (±20\%)}$					
C. 2	$\text{OG IX resolver error} = \frac{2 \text{ (SCA output (VDC) (B. 44. a) - 2.5V PCM bias)}}{\text{SCA input (VAC) (B. 46. a)}} = 1 \text{ (±10\%)}$					

\*Parameters not available in LEM Operational SCA,  
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EQUIPMENT TEST  
DATA SHEET 13 OF 18

JDC  
NO. 12620  
REV. F

JOB LEM SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

CALCULATIONS	REJ ACC
C. 3 (cont)	
*MG IX resolver sin $\pm 10^\circ = \frac{2 \text{ (SCA output (VDC) (B. 46. c) -2.5V PCM bias)}}{\text{SCA input (VAC) (B. 46. c)}}$ = 1 ( $\pm 10\%$ )	
*IG IX resolver sin $\pm 10^\circ = \frac{2 \text{ (SCA output (VDC) (B. 46. b) -2.5V PCM bias)}}{\text{SCA input (VAC) (B. 46. b)}}$ = 1 ( $\pm 10\%$ )	
C. 3	
IG IX resolver cos $(45^\circ) = \frac{8.5 \text{ (SCA output (VDC) (B. 49. a) -2.5V PCM bias)}}{\text{SCA input (VAC) (B. 49. a)}}$ = 1 ( $\pm 10\%$ )	
MG IX resolver cos $(45^\circ) = \frac{8.5 \text{ (SCA output (VDC) (B. 49. b) -2.5V PCM bias)}}{\text{SCA input (VAC) (B. 49. b)}}$ = 1 ( $\pm 10\%$ )	
OG IX resolver cos $(45^\circ) = \frac{8.5 \text{ (SCA output (VDC) (B. 49. c) -2.5V PCM bias)}}{\text{SCA input (VAC) (B. 49. c)}}$ = 1 ( $\pm 10\%$ )	

\* Parameters not available in LEM Operational SCA,  
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JDC  
NO. 12620  
REV. F

JOB LEM SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

CALCULATIONS	REJ ACC
C. 3 (cont)	
IG IX resolver sin $(45^\circ) = \frac{8.5 \text{ (SCA output (VDC) (B. 49. d) -2.5V PCM bias)}}{\text{SCA input (VAC) (B. 49. d)}}$ = 1 ( $\pm 10\%$ )	
MG IX resolver sin $(45^\circ) = \frac{8.5 \text{ (SCA output (VDC) (B. 49. e) -2.5V PCM bias)}}{\text{SCA input (VAC) (B. 49. e)}}$ = 1 ( $\pm 10\%$ )	
OG IX resolver sin $(45^\circ) = \frac{8.5 \text{ (SCA output (VDC) (B. 49. f) -2.5V PCM bias)}}{\text{SCA input (VAC) (B. 49. f)}}$ = 1 ( $\pm 10\%$ )	
IG IX resolver cos $(135^\circ) = \frac{8.5 \text{ (SCA output (VDC) (B. 52. a) -2.5V PCM bias)}}{\text{SCA input (VAC) (B. 52. a)}}$ = -1 ( $\pm 10\%$ )	
MG IX resolver cos $(135^\circ) = \frac{8.5 \text{ (SCA output (VDC) (B. 52. b) -2.5V PCM bias)}}{\text{SCA input (VAC) (B. 52. b)}}$ = -1 ( $\pm 10\%$ )	

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APOLLO 60N  
EQUIPMENT TEST  
DATA SHEET 15 OF 18

JDC  
NO. 12620  
REV. F

JOB LEM SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

CALCULATIONS	REJ ACC
C. 3. (cont)	
OG IX resolver cos $(135^\circ) = \frac{8.5 \text{ (SCA output (VDC) (B. 52. c) -2.5V PCM bias)}}{\text{SCA input (VAC) (B. 52. c)}}$ = -1 ( $\pm 10\%$ )	
IG IX resolver sin $(135^\circ) = \frac{8.5 \text{ (SCA output (VDC) (B. 52. d) -2.5V PCM bias)}}{\text{SCA input (VAC) (B. 52. d)}}$ = 1 ( $\pm 10\%$ )	
MG IX resolver sin $(135^\circ) = \frac{8.5 \text{ (SCA output (VDC) (B. 52. e) -2.5V PCM bias)}}{\text{SCA input (VAC) (B. 52. e)}}$ = 1 ( $\pm 10\%$ )	
OG IX resolver sin $(135^\circ) = \frac{8.5 \text{ (SCA output (VDC) (B. 52. f) -2.5V PCM bias)}}{\text{SCA input (VAC) (B. 52. f)}}$ = 1 ( $\pm 10\%$ )	
IG IX resolver cos $(225^\circ) = \frac{8.5 \text{ (SCA output (VDC) (B. 55. a) -2.5V PCM bias)}}{\text{SCA input (VAC) (B. 55. a)}}$ = -1 ( $\pm 10\%$ )	
MG IX resolver cos $(225^\circ) = \frac{8.5 \text{ (SCA output (VDC) (B. 55. b) -2.5V PCM bias)}}{\text{SCA input (VAC) (B. 55. b)}}$ = -1 ( $\pm 10\%$ )	

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EQUIPMENT TEST  
DATA SHEET 16 OF 18

JDC  
NO. 12620  
REV. F

JOB LEM SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

CALCULATIONS	REJ ACC
C. 3 (cont)	
OG IX resolver cos $(225^\circ) = \frac{8.5 \text{ (SCA output (VDC) (B. 55. c) -2.5V PCM bias)}}{\text{SCA input (VAC) (B. 55. c)}}$ = -1 ( $\pm 10\%$ )	
IG IX resolver sin $(225^\circ) = \frac{8.5 \text{ (SCA output (VDC) (B. 55. d) -2.5V PCM bias)}}{\text{SCA input (VAC) (B. 55. d)}}$ = -1 ( $\pm 10\%$ )	
MG IX resolver sin $(225^\circ) = \frac{8.5 \text{ (SCA output (VDC) (B. 55. e) -2.5V PCM bias)}}{\text{SCA input (VAC) (B. 55. e)}}$ = -1 ( $\pm 10\%$ )	
OG IX resolver sin $(225^\circ) = \frac{8.5 \text{ (SCA output (VDC) (B. 55. f) -2.5V PCM bias)}}{\text{SCA input (VAC) (B. 55. f)}}$ = -1 ( $\pm 10\%$ )	
IG IX resolver cos $(315^\circ) = \frac{8.5 \text{ (SCA output (VDC) (B. 58. a) -2.5V PCM bias)}}{\text{SCA input (VAC) (B. 58. a)}}$ = 1 ( $\pm 10\%$ )	
MG IX resolver cos $(315^\circ) = \frac{8.5 \text{ (SCA output (VDC) (B. 58. b) -2.5V PCM bias)}}{\text{SCA input (VAC) (B. 58. b)}}$ = 1 ( $\pm 10\%$ )	

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JOB LEM SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

CALCULATIONS	REJ/ACC
C.3 (cont)	
OG 1X resolver cos (315°) = $\frac{8.5 \text{ (SCA output (VDC) (B. 58. c) - 2.5V PCM bias)}}{\text{SCA input (VAC) (B. 58. c)}}$ = 1 (±10%)	
IG 1X resolver sin (315°) = $\frac{8.5 \text{ (SCA output (VDC) (B. 58. d) - 2.5V PCM bias)}}{\text{SCA input (VAC) (B. 58. d)}}$ = -1 (±10%)	
MG 1X resolver sin (315°) = $\frac{8.5 \text{ (SCA output (VDC) (B. 58. e) - 2.5V PCM bias)}}{\text{SCA input (VAC) (B. 58. e)}}$ = -1 (±10%)	
OG 1X resolver sin (315°) = $\frac{8.5 \text{ (SCA output (VDC) (B. 58. f) - 2.5V PCM bias)}}{\text{SCA input (VAC) (B. 58. f)}}$ = -1 (±10%)	
C.4	
Yaw attitude error = $\frac{2.44 \text{ (SCA output (VDC) (B. 89. a) - 2.5V PCM bias)}}{\text{SCA input (VAC) (B. 89. a)}}$ = 1 (±10%)	

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JOB LEM SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

CALCULATIONS	REJ/ACC
C.4 (cont)	
Pitch attitude error = $\frac{2.44 \text{ (SCA output (VDC) (B. 89. b) - 2.5V PCM bias)}}{\text{SCA input (VAC) (B. 89. b)}}$ = 1 (±10%)	
Roll attitude error = $\frac{2.44 \text{ (SCA output (VDC) (B. 89. c) - 2.5V PCM bias)}}{\text{SCA input (VAC) (B. 89. c)}}$ = 1 (±10%)	
C.5	
IG servo error = $\frac{\text{SCA output (VDC) (B. 21 test a)}}{\text{SCA input (VAC) (B. 21 test a)}}$ = 0.91 (±15%)	
MG servo error = $\frac{\text{SCA output (VDC) (B. 21 test b)}}{\text{SCA input (VAC) (B. 21 test b)}}$ = 0.91 (±15%)	
OG servo error = $\frac{\text{SCA output (VDC) (B. 21 test c)}}{\text{SCA input (VAC) (B. 21 test c)}}$ = 0.91 (±15%)	

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SUBSYSTEM LEM G & N SYSTEM

DESCRIPTION This JDC provides a functional checkout procedure for the Signal Conditioner Assembly. Functional operation is evaluated by checking Signal Conditioner Assembly input and output data for proper correlation. Procedural methods are incorporated to cause signal generation in normally muted loops where possible in a G and N test configuration for minimum checkout capability.

Rev	Let	Date	NO.	JDC	APPROVAL	REFERENCES
A	B-24-87	34419	All	All	EA/12	PS 6015000 JDC 12614
B	B-31-87	34478	1, 2, 4-8, 10, 11, 13, 14	1-3, 12, 15-17	EA/12	IMPORTANT
C	10-10-87	34802	12	-	EA/12	See below
D	1-12-88	35421	1, 2, 4-12, 15, 16	1-8, 10-16, 18	EA/12	INTERVAL
E	2-6-88	35561	7, 12, 13	3	EA/12	-
F	3-28-88	35977	1-3, 5-8, 10-13	4, 5, 12, 13	EA/12	TOOLS AND MATERIAL
G	7-25-88	36586	1, 9, 10, 12	-	EA/12	-

IMPORTANT: 1. Insure that connector assembly (2003099) is connected to the LGC test connector. 2. Step numbers preceded by an asterisk are not to be performed when testing with LEM Operational SCA, P/N 6007013. Perform all steps when testing with LEM Flight Qualification SCA, P/N 6007010.

NOTE: If the VERB display on the DSKY contains a number from 11 to 17, the KEY REL indicator may flash when DSKY entries are made.

3. Visually inspect J2 on Signal Conditioner Module (SCM) breakout box and 30J1 on SCA to insure that pins and sockets are not bent or damaged.

4. Carefully locate J2 on guide pins of 30J1; ease plug onto connector, maintaining parallelism between plug and connector as closely as possible; and engage jackscrews until finger tight.

5. Turn each jackscrew one turn at a time moving around connector in sequence until plug and connector are fully engaged.

VERIFICATION WITH SIDL REQUIRED BEFORE USE

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FOR 1-6-133  
Chg. 3-1-86

SUBSYSTEM LEM G & N SYSTEM

6. Set gain of oscillograph channel 8 at 2 v/cm and zero adjust channel 8 for a centered trace with a 2.5 vdc bias input by off-setting zero line 12.5 mm to right of center line.

7. Insure that PROCEED indicator of PROCEED/ISS OPERATE pushbutton on Test Control panel is lighted and the STAND-BY requirements of JDC 12614 have been satisfied.

8. Press CHART SPEED/5 pushbutton on Oscillograph Control panel and set CHART DRIVE switch to CM/HR.

9. Obtain oscillograph record of PIPA loop closure data by performing following steps successively for each position of Test Selector panel listed in table I:

a. After a minimum of 5 minutes in ISS STANDBY mode, set CHART DRIVE switch on oscillograph control panel to MM/SEC and press PROCEED/ISS OPERATE pushbutton on Test Control panel.

b. Wait at least 10 seconds following PIPA loop closure when in tests a and b, then press the PROCEED/ISS STANDBY pushbutton. Following test c, allow system to remain in ISS OPERATE mode.

c. Following each test, set Chart Drive switch on oscillograph control panel to cm/hr. Check oscillograph recording for indications of PIPA loop closure on channel 8 correlating to the loop closure indications on channels 4,

Test	Test Selector Panel Position	Signal
a	117	Z PIPA S/G in-phase output
b	118	Y PIPA S/G in-phase output
c	119	X PIPA S/G in-phase output

10. On the Primary Signal Selector panel, set the CROSSBAR CONTROL switches to 17S and adjust the G & N POWER ADJUST control on the Test Control panel until the DVM indicates 28 (±0.25) vdc. Record DVM indication. Following measurement, return CROSSBAR CONTROL switches to 37L.

11. Set Test Selector panel to positions indicated and measure and record following voltages on DVM:

NOTE: The SCA TEST TMC INHIBIT indicator on the Temperature Monitor Control panel will illuminate when the Test Selector Crossbar is in positions 201 and 202. Following measurements in these positions, push SIGNAL CONDITIONER LEVEL 2 ENABLE pushbutton and verify that the above inhibit indicator extinguishes.

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SUBSYSTEM LEM G & N SYSTEM

6. Reinstall DSKY Mounting Pedestal with DSKY on the Component Mounting Plate, attach ground strap and mate cable W143 to DSKY.

7. Perform JDC 12614 to place the G and N system in ISS STANDBY mode with the LGC operating.

8. Connect PSA Test Point Adapter (TPA 42) direct probes to TBI-29 (H) and TBI-22 (L).

9. Connect jumper between PROBES OUTPUT DIRECT jacks and DVM IN jacks on Auxiliary Input Panel.

NOTE: The 28 VDC G & N Power adjusted in the following step will vary as result of heater cycling.

10. On Primary Signal Selector panel, set CROSSBAR CONTROL switches to 120 and adjust G & N POWER ADJUST control on Test Control panel until DVM indicates 28 (±1.0) vdc. Record DVM indication.

B. PROCEDURE

28 VDC STANDBY AND LGC OPERATE

1. Connect SCA GSE Distribution Box (GDB) stepper switch to DVM by setting CROSSBAR CONTROL switches on Primary Signal Selector panel to 37L.

NOTE: To position Test Selector panel, perform following operations:

a. Press SIGNAL CONDITIONER LEVEL 1

ENABLE pushbutton if first digit on Test Selector panel position is 1, or press

SIGNAL CONDITIONER LEVEL 2 ENABLE pushbutton if first digit is 2.

b. Press PUSH TO ADVANCE pushbutton until display indicates last two digits.

2. Set Test Selector panel to positions indicated and measure and record the following voltages on DVM.

Test Selector Panel Position Voltage

101 28 vdc LGC operate (GG1523X)

102 28 vdc IMU standby (GG1513X)

PIPA S/G OUTPUT

3. Connect following signals to oscillograph by setting switches on Oscillograph Signal Selector panel to positions indicated:

Switch Signal

CHANNEL 4 to 1 Z PIPA S/G output (GG2041V)

CHANNEL 5 to 1 Y PIPA S/G output (GG2021V)

CHANNEL 6 to 1 X PIPA S/G output (GG2001V)

CHANNEL 8 to 4 SCA GDB stepper switch

4. Insure that CH AC indicators are lighted for channels 4, 5, and 6.

a. Set PHASE SHIFT SELECTOR switch on demods to VARIABLE and zero oscillograph channels 4, 5, and 6. Set gains at 500 mv/mm following adjustments.

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Test Selector Panel Position

\*135 Cal. Mod. Temperature (GG6020T)

\*145 R & D 2.5 vdc bias (GG1111V)

\*150 IMU Heater Current (GG3302X)

201 Y PIPA Temperature (GG3300T)

\*202 IRIG Temperature (GG3301T)

103 120 vdc Reference (GG1040V)

104 2.5 vdc PCM bias (GG1110V)

106 3200 cps 28 volt supply (GG1331V)

113 900 cps 28 volt supply (GG1201V)

IG, MG, AND OG SERVO ERRORS

12. Perform following DSKY operations:

a. VERB 36 ENTR

b. VERB 41 NOUN 20 ENTR

c. Observe: VERB 21 NOUN 22 Flashing ENTR

d. +00000

e. Observe: VERB 23 NOUN 22 Flashing ENTR

f. +00000

g. Observe: VERB 23 NOUN 22 Flashing ENTR

h. +00000

\*Not applicable to LEM Operational SCA, P/N 6007013.

13. Deleted

14. Deleted

15. Deleted

16. Deleted

17. Set switches on Signal Generator as follows:

RANGE to X.01

FREQUENCY meter to 6.0

FUNCTION to SQUARE

DC BALANCE to midposition

AMPLITUDE to 70.

18. Perform the following DSKY operations:

a. VERB 42 ENTR

b. VERB 33 ENTR

19. Set FUNCTION control on PAVM to 0° and 3200° positions.

20. Press GIMBAL SERVO TEST pushbutton on Test Selector panel. The pushbutton shall light.

21. Obtain stabilization loop servo error data by performing the following steps for each test listed in Table II:

a. Press to light TEST START pushbutton on Test Selector panel.

NOTE: The SCA input voltage will cause the PAVM to alternately swing left and right. Determine the maximum deflection in each direction. Add the absolute values to obtain maximum meter spread.

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SUBSYSTEM LEM G & N SYSTEM

ASSY

b. Record maximum meter spread of SCA input voltages on PAVM.

NOTE: The SCA output voltage will cause the DVM to alternately indicate a high value and a low value. Determine each value. Subtract lower value from higher value to obtain maximum meter spread.

c. Record maximum meter spread of SCA output voltages on DVM.

d. Press TEST STOP pushbutton on Test Selector panel; the TEST START pushbutton shall go out.

22. Press to extinguish GIMBAL SERVO TEST pushbutton.

23. Deleted

Table II			
Test	Gimbal Servo Test Switch Position (CROSSBAR to 271)	Signal	CROSSBAR CONTROL Position (PAVM)
a	1	IG servo error	135
b	2	MG servo error	134
c	3	OG servo error	133

\* IG, MG, AND OG TORQUE MOTOR CURRENTS (GG2110C, 2140C, and 2170C)

\*24. Insure that AMPLITUDE control on Signal Generator is set to 0.

\*25. Connect jumper between PROBE 3 OUTPUT DIRECT jacks and CH 6 DC IN jacks on Auxiliary Input panel.

\*26. Set OSCILLOGRAPH SELECTOR CHANNEL 6 switch on Oscillograph Signal Selector panel to AUX.

\*27. Insure that CH 6 DC indicator is lighted.

\*28. Zero oscillograph channel 6 and set gain at 0.2 v/cm. Set gain of channel 8 at 2 v/cm and zero adjust channel 8 for a centered trace with a 2.5 vdc bias input by off-setting zero line 12.5 mm to right of chart center line.

\*29. Set FREQUENCY meter on Signal Generator to 5 and RANGE switch to X10.

\*30. Set CHART DRIVE switch on Oscillograph Control panel to MM/SEC.

\*31. Set CROSSBAR CONTROL switches on Primary Signal Selector panel to 176 to monitor Signal Generator output on oscilloscope.

\*32. Press the GIMBAL SERVO TEST pushbutton. The pushbutton shall light.

\*33. Obtain oscillograph trace of torque motor currents by performing the following steps for each test listed in table III.

a. Connect PSA TPA Test Points to direct probes.

\*Not applicable to LEM Operational SCA, P/N 6007013.

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LEM SIGNAL CONDITIONER  
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SUBSYSTEM LEM G & N SYSTEM

ASSY

b. Set Test Selector CROSSBAR and GIMBAL SERVO TEST switch as indicated.

c. Press TEST START pushbutton on Test Selector panel. The pushbutton shall light.

d. Increase Signal Generator AMPLITUDE control until the oscilloscope indicates value listed in table III for each test.

e. Press TEST STOP pushbutton on the Test Selector panel. The pushbutton shall extinguish.

\*34. Press the GIMBAL SERVO TEST pushbutton. The pushbutton shall extinguish.

\*35. Set CHART DRIVE switch on Oscillograph Control panel to CM/HR. Record peak-to-peak SCA input signal monitored on channel 6 and peak-to-peak SCA output signal monitored on channel 8.

\*IG, MG, AND OG CDU FINE ERRORS (GG2220, 2250 and 2260)

\*36. Perform following DSKY operations:

a. VERB 41 NOUN 20 ENTR

b. Observe:

VERB 21 NOUN 23 Flashing

\*Not applicable to LEM Operational SCA, P/N 6007013.

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LEM SIGNAL CONDITIONER  
JOB FUNCTIONAL CHECKOUT.

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SUBSYSTEM LEM G & N SYSTEM

ASSY

Table III			
Test	Signal Generator Output On Oscilloscope	PSA TPA Test Points	Signal
a	2V peak-to-peak	TB2-31 TB1-49	1 IG torque motor curr.
b	1V peak-to-peak	TB2-32 TB1-49	2 MG torque motor curr.
c	1V peak-to-peak	TB1-45 TB1-49	3 OG torque motor curr.

a. Observe:

VERB 21 NOUN 22 Flashing

c. +00100 ENTR

p. Observe:

VERB 22 NOUN 22 Flashing

q. +00100 ENTR

r. Observe:

VERB 23 NOUN 22 Flashing

s. +00100 ENTR

Table IV		Latitude
MIT		+42.366
ACSP		+42.903
GAEC		+40.748
MSC		+29.556
KSC		+28.516
NAA		+33.921

\*39. Within 10 to 90 seconds following step 38, a, perform the following DSKY operations:

a. VERB 21 NOUN 01 ENTR

b. 02512 ENTR

c. 00000 ENTR

d. VERB 16 NOUN 20 ENTR

\*Not applicable to LEM Operational SCA, P/N 6007013.

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CHG. 7-23-66

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SUBSYSTEM LEM G & N SYSTEM

ASSY

Table V			
Test	PSA TPA Test Points	Test Selector Panel Position	Signal
a	TB3-37 TB3-34	140	IG CDU fine error
b	TB3-38 TB3-34	141	MG CDU fine error
c	TB3-41 TB3-34	142	OG CDU fine error

\*43. Perform the following DSKY operations:

a. VERB 21 NOUN 01 ENTR

b. 02512 ENTR

c. 77776 ENTR

\*IG, MG, AND OG IX RESOLVER SIN  $\pm 10$  DEGREES (GG2121, 2151, and 2131)

\*44. Perform following DSKY operations:

a. VERB 41 NOUN 20 ENTR

b. Observe:

VERB 21 NOUN 22 Flashing

c. +01000 ENTR

d. Observe:

VERB 23 NOUN 22 Flashing

e. +01000 ENTR

\*45. On DSKY, enter V16 N20 ENTR and verify that contents of  $R_1$ ,  $R_2$ , and  $R_3$  are approximately 01000.

\*46. Alternately connect SCA input and SCA output to DVM by setting Test Selector panel and CROSSBAR CONTROL switches to positions listed in table VI. For each test, perform following operations:

a. Set CROSSBAR CONTROL switches to 271.

b. Set Test Selector panel to position listed in table VI and record SCA output indicated on DVM.

c. Set CROSSBAR CONTROL switches to position listed in table VI and record SCA input indicated on DVM.

Table VI

Test	CROSSBAR Test Selector Panel Position	Signal
a	142	203 OG IX resolver sin $\pm 10^\circ$
b	144	204 IG IX resolver sin $\pm 10^\circ$
c	143	205 MG IX resolver sin $\pm 10^\circ$

IG, MG, AND OG IX RESOLVER SIN AND COS

\*47. Perform following DSKY operations:

a. VERB 41 NOUN 20 ENTR

b. Observe:

VERB 21 NOUN 22 Flashing

c. +04500 ENTR

d. Observe:

VERB 23 NOUN 22 Flashing

e. +04500 ENTR

\*Not applicable to LEM Operational SCA, P/N 6007013.

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## SUBSYSTEM LEM G &amp; N SYSTEM

ASSY

f. Observe:

VERB 23 NOUN 22 Flashing

e. +04500

b. Observe:

VERB 21 NOUN 22 Flashing

c. +13500

d. Observe:

VERB 22 NOUN 22 Flashing

e. +13500

f. Observe:

VERB 23 NOUN 22 Flashing

g. +13500

h. Observe:

GIMBAL LOCK lamp is lighted.

i. VERB 16 NOUN 20 ENTR

51. Monitor and record the contents of

R<sub>1</sub>, R<sub>2</sub>, and R<sub>3</sub>.

52. Repeat step 49.

53. Perform following DSKY operations:

a. VERB 41 NOUN 20 ENTR

b. Observe:

VERB 21 NOUN 22 Flashing

c. +22500

d. Observe:

VERB 23 NOUN 22 Flashing

e. +22500

f. Observe:

VERB 23 NOUN 22 Flashing

g. +22500

h. VERB 16 NOUN 20 ENTR

54. Monitor and record the contents of

R<sub>1</sub>, R<sub>2</sub>, and R<sub>3</sub>.

55. Repeat step 49.

56. Perform following DSKY operations:

a. VERB 41 NOUN 20 ENTR

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Test	CROSSBAR CONTROL Position	Test Selector Panel Position	Signal
a	243	120	IG IX resolver cos (GG2113V)
b	242	131	MG IX resolver cos (GG2143V)
c	241	122	OG IX resolver cos (GG2173V)
d	144	123	IG IX resolver sin (GG2112V)
e	143	124	MG IX resolver sin (GG2142V)
f	145	125	OG IX resolver sin (GG2172V)

Table VII

## SUBSYSTEM LEM G &amp; N SYSTEM

ASSY

a. VERB 21 NOUN 22 Flashing

c. +31500

d. Observe:

VERB 22 NOUN 22 Flashing

e. +31500

f. Observe:

VERB 23 NOUN 22 Flashing

g. +31500

h. VERB 16 NOUN 20 ENTR

57. Monitor and record the contents of

R<sub>1</sub>, R<sub>2</sub>, and R<sub>3</sub>.

58. Repeat step 49.

59. Perform following DSKY operations:

a. VERB 41 NOUN 20 ENTR

b. Observe:

VERB 21 NOUN 22 Flashing

c. +00000

d. Observe:

VERB 23 NOUN 22 Flashing

e. +00000

f. Observe:

VERB 23 NOUN 22 Flashing

g. +00000

60. Resolver Circuit Tester Preparation

(RCT)

a. Set all Decade Error Bridge switches

and controls to OFF, minimum or

zero.

b. Connect cable W173 to GSE distribution

box (GDB).

c. Connect RCT power cable to facility

115 vac power.

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## SUBSYSTEM LEM G &amp; N SYSTEM

ASSY

FINE indicator lights. Rotate RESOLVER ANGLE TRANSMITTER control and observe null meter. When null meter deflects right (+) while rotating the RESOLVER ANGLE TRANSMITTER control CW, the 1X or fine resolver is at one of its 32 nulls. When both coarse and fine resolvers are at the correct null (zero) meter will deflect right (+) when the RESOLVER ANGLE TRANSMITTER control is rotated CW (increasing angle).

a. Select MON COARSE.

o. With the SENSITIVITY control fully CCW, set the REFERENCE QUADRANT switch to 90° - 180° and set DEB DEGREES dial to 90°.

p. Null meter using REFERENCE QUADRANT VERNIER control. Leave the REFERENCE QUADRANT VERNIER control in this position for all following tests.

q. Set REFERENCE QUADRANT switch to 0° - 90°.

\*61. Set RESOLVER ANGLE TRANSMITTER control to 0.

\*62. Press READ MODE/SET MODE pushbutton to light SET MODE indicator.

\*63. Press SHAFT SELECT/SET ENABLE pushbutton. Both halves of pushbutton will light.

\*64. Connect shaft CDU fine error output from SCA to DVM by setting Test Selector panel to 146.

NOTE: G/N CAUTION lamp on the Monitor Panel and PROG alarm lamp on the DSKY will light during performance of steps 64 through 72. Ignore the lamp indications.

\*64. Perform following DSKY operations:

a. VERB 40 NOUN 40 ENTR

b. VERB 21 NOUN 10 ENTR

c. 00012

d. 00011

\*64. Monitor SCA input on PAVM by connecting P8A TPA buffered probe to TBS-30 (4b) and TBS-34 (4c) and connecting a jump wire between PROBES OUTPUT BUFFERED jacks and PAVM IN jacks on Auxiliary Input panel. Set PAVM Crossbar Control switch on Primary Signal Selector panel to AUX.

\*67. Adjust RESOLVER ANGLE TRANSMITTER control to produce a minimum total voltage signal on PAVM. Record DVM indication.

\*68. Adjust RESOLVER ANGLE TRANSMITTER control until the in-phase voltage on the PAVM is +750 mv. Record the DVM indication.

\*69. Press TRUN SELECT/SET ENABLE pushbutton. Both halves of pushbutton will light.

\*70. Connect trunion CDU fine error output from SCA to DVM by setting Test Selector panel to 147.

\*Not applicable to LEM Operational SCA, P/N 6007013.

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## SUBSYSTEM LEM G &amp; N SYSTEM

ASSY

\*71. Remove P8A TPA buffered probe from TBS-33 (4a) and connect to TBS-30 (4b).

\*72. Adjust RESOLVER ANGLE TRANSMITTER control until in-phase voltage on the PAVM is +720 mv. Record the DVM indication.

\*73. Adjust RESOLVER ANGLE TRANSMITTER control until PAVM indicates minimum total voltage signal. Record DVM indication.

\*74. Perform following DSKY operations:

a. VERB 21 NOUN 10 ENTR

b. 00012

c. 00010

d. 00010

\*74. Monitor SCA input on PAVM by connecting P8A TPA buffered probe to TBS-30 (4b) and TBS-34 (4c) and connecting a jump wire between PROBES OUTPUT BUFFERED jacks and PAVM IN jacks on Auxiliary Input panel. Set PAVM Crossbar Control switch on Primary Signal Selector panel to AUX.

\*67. Adjust RESOLVER ANGLE TRANSMITTER control to produce a minimum total voltage signal on PAVM. Record DVM indication.

\*68. Adjust RESOLVER ANGLE TRANSMITTER control until the in-phase voltage on the PAVM is +750 mv. Record the DVM indication.

\*69. Press TRUN SELECT/SET ENABLE pushbutton. Both halves of pushbutton will light.

\*70. Connect trunion CDU fine error output from SCA to DVM by setting Test Selector panel to 147.

h. DEB/RCT - adjust RESOLVER ANGLE TRANSMITTER and SENSITIVITY controls to achieve best null on most sensitive coarse scale.

i. DEB - SENSITIVITY to fully CCW.

j. RCT - MON FINE to lighted.

k. DEB - DEGREES to 0 + 00000.

l. DEB/RCT - adjust RESOLVER ANGLE TRANSMITTER and SENSITIVITY controls to achieve best null on most sensitive fine scale.

m. DEB - SENSITIVITY to fully CCW.

n. RCT - remove switch setting from step c.

\*77. Press TRUN SELECT/SET ENABLE pushbutton on Resolver Circuit Tester Control panel. Both halves of pushbutton will light.

78. Enter VERB 00 NOUN 40 into DSKY and press ENTR pushbutton. Verify on DSKY that contents of R<sub>1</sub> is approximately 04500 and R<sub>2</sub> is approximately 00000.

78A. Set CROSSBAR CONTROL on Primary Signal Selector panel to 271.

79. Set Test Selector panel to following positions. At each position, record SCA output of following signals on DVM:

Test Selector Panel Position	Signal
128	Trunion 1X resolver sin (GG3324V)
131	Trunion 1X resolver cos (GG3325V)
80.	Press SHAFT SELECT/SET ENABLE pushbutton on Resolver Circuit Tester Control panel. Both halves of pushbutton will light.

\*Not applicable to LEM Operational SCA, P/N 6007013.

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# LEM SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

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SUBSYSTEM	LEM G & N SYSTEM	ASSY
91. Enter VERB 04 NOUN 40 into DSKY and press ENTR pushbutton. Verify on DSKY that contents of $R_1$ is approximately 00000 and $R_2$ is approximately 04500.		NOTE: ISS WARNING lamp on Monitor panel may light during step 96. Ignore lamp indication.
92. Set Test Selector panel to following positions. At each position, record SCA output of following signals on DVM:		96. Perform following DSKY operations:
Test Selector Panel Position	Signal	a. VERB 21 NOUN 10 ENTR
129	Shaft 1X resolver sin (GG3304V)	b. 00012 ENTR
130	Shaft 1X resolver cos (GG3305V)	c. 00060 ENTR
93. Set RESOLVER ANGLE TRANSMITTER control to 0.		97. Perform following DSKY operations:
94. Set 800~ REFERENCE INPUT VOLT-AGE switch on Decade Error Bridge panel to OFF.		a. VERB 43 ENTR
YAW, PITCH, AND ROLL ATTITUDE ERRORS (GG2249V, 2219V and 2279V)		b. Observe: VERB 21 NOUN 22 Flashing
95. Perform following DSKY operations:		c. +01600 ENTR
a. VERB 36 ENTR		d. Observe: VERB 22 NOUN 22 Flashing
b. VERB 41 NOUN 20 ENTR		e. +01600 ENTR
c. Observe: VERB 21 NOUN 22 Flashing		f. Observe: VERB 23 NOUN 22 Flashing
d. +00000 ENTR		g. +01600 ENTR
e. Observe: VERB 22 NOUN 22 Flashing		98. Connect jumper between PROBES OUTPUT DIRECT jacks and PAVM IN jacks on Auxiliary Input Panel. Set PAVM Crossbar Control switch on Primary Signal Selector panel to AUX.
f. +00000 ENTR		99. Connect SCA input to PAVM and SCA output to DVM by connecting P8A TPA direct probe to test points listed in table VIII and setting Test Selector panel to positions indicated. Record SCA total voltage input on PAVM and SCA output on DVM for each test.
g. Observe: VERB 23 NOUN 22 Flashing		90. Perform the following DSKY operations:
h. +00000 ENTR		a. VERB 36 ENTR
		b. VERB 41 NOUN 20 ENTR
		c. Observe: VERB 21 NOUN 22 Flashing

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# LEM SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

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SUBSYSTEM	LEM G & N SYSTEM	ASSY
a. +00000 ENTR		b. +00000 ENTR
c. Observe: VERB 23 NOUN 22 Flashing		91. Press POWER OFF on Resolver Circuit Tester Control Panel.
f. +00000 ENTR		92. Disconnect cable W172 from GDB.
g. Observe: VERB 23 NOUN 22 Flashing		

Table VIII

Test	P8A TPA Test Points		Test Selector Panel Position	Signal
	High	Low		
a	TB4-43	TB4-47	114	Yaw attitude error
b	TB4-45	TB4-49	115	Pitch attitude error
c	TB4-44	TB4-48	116	Roll attitude error

## C. CALCULATIONS

1. Perform following CDU fine error calculations:

$$a. \text{ IG CDU fine error} = \frac{\text{SCA output (VDC)} - 2.5V \text{ R\&D bias}}{2.00 \times \text{SCA input (VAC)}} = 1 (\pm 20\%)$$

$$b. \text{ MG CDU fine error} = \frac{\text{SCA output (VDC)} - 2.5V \text{ R\&D bias}}{2.00 \times \text{SCA input (VAC)}} = 1 (\pm 20\%)$$

$$c. \text{ OG CDU fine error} = \frac{\text{SCA output (VDC)} - 2.5V \text{ R\&D bias}}{2.00 \times \text{SCA input (VAC)}} = 1 (\pm 20\%)$$

2. Perform following 1X resolver sin  $\pm 10^\circ$  degree calculations:

$$a. \text{ OG 1X resolver sin } \pm 10^\circ = \frac{2 (\text{SCA output (VDC)} - 2.5V \text{ PCM bias})}{\text{SCA input (VAC)}} = 1 (\pm 10\%)$$

$$b. \text{ MG 1X resolver sin } \pm 10^\circ = \frac{2 (\text{SCA output (VDC)} - 2.5V \text{ PCM bias})}{\text{SCA input (VAC)}} = 1 (\pm 10\%)$$

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# LEM SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

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SUBSYSTEM	LEM G & N SYSTEM	ASSY
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$$c. \text{ IG 1X resolver sin } \pm 10^\circ = \frac{2 (\text{SCA output (VDC)} - 2.5V \text{ PCM bias})}{\text{SCA input (VAC)}} = 1 (\pm 10\%)$$

3. Perform following 1X resolver cos and sin calculations:

$$a. \text{ IG 1X resolver cos} = \frac{8.5 (\text{SCA output (VDC)} - 2.5V \text{ PCM bias})}{\text{SCA input (VAC)}} = 1 (\pm 10\%)$$

$$b. \text{ MG 1X resolver cos} = \frac{8.5 (\text{SCA output (VDC)} - 2.5V \text{ PCM bias})}{\text{SCA input (VAC)}} = 1 (\pm 10\%)$$

$$c. \text{ OG 1X resolver cos} = \frac{8.5 (\text{SCA output (VDC)} - 2.5V \text{ PCM bias})}{\text{SCA input (VAC)}} = 1 (\pm 10\%)$$

$$d. \text{ IG 1X resolver sin} = \frac{8.5 (\text{SCA output (VDC)} - 2.5V \text{ PCM bias})}{\text{SCA input (VAC)}} = 1 (\pm 10\%)$$

$$e. \text{ MG 1X resolver sin} = \frac{8.5 (\text{SCA output (VDC)} - 2.5V \text{ PCM bias})}{\text{SCA input (VAC)}} = 1 (\pm 10\%)$$

$$f. \text{ OG 1X resolver sin} = \frac{8.5 (\text{SCA output (VDC)} - 2.5V \text{ PCM bias})}{\text{SCA input (VAC)}} = 1 (\pm 10\%)$$

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4. Perform following attitude error calculations:

$$a. \text{ Yaw attitude error} = \frac{2.44 (\text{SCA output (VDC)} - 2.5V \text{ PCM bias})}{\text{SCA input (VAC)}} = 1 (\pm 10\%)$$

$$b. \text{ Pitch attitude error} = \frac{2.44 (\text{SCA output (VDC)} - 2.5V \text{ PCM bias})}{\text{SCA input (VAC)}} = 1 (\pm 10\%)$$

$$c. \text{ Roll attitude error} = \frac{2.44 (\text{SCA output (VDC)} - 2.5V \text{ PCM bias})}{\text{SCA input (VAC)}} = 1 (\pm 10\%)$$

5. Perform the following servo error calculations:

$$a. \text{ IG servo error} = \frac{\text{SCA output (VDC)}}{\text{SCA input (VAC)}} = 0.91 (\pm 15\%)$$

$$b. \text{ MG servo error} = \frac{\text{SCA output (VDC)}}{\text{SCA input (VAC)}} = 0.91 (\pm 15\%)$$

$$c. \text{ OG servo error} = \frac{\text{SCA output (VDC)}}{\text{SCA input (VAC)}} = 0.91 (\pm 15\%)$$

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JOB LEM SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

TITLE _____		DATE _____		TEST HISTORY	
SER. NO. _____	DWG _____	REV. _____	TIME _____	START _____	END _____
MAJOR GROUND SUPPORT EQUIPMENT					
NAME _____		SER. NO. _____		CAL DATE _____	
NAME _____		SER. NO. _____		CAL DATE _____	
CONDUCTED BY _____		NAME/AFFILIATION _____		APPROVED BY _____	
NAME/AFFILIATION _____		NAME/AFFILIATION _____			

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ ACC
A. 10	Bus Voltage	VDC	27.00		29.00	
B. 2	28 VDC LDC Operate	VDC	3.9		4.8	
	28 VDC IMU Standby	VDC	3.9		4.8	
B. 9	Loop Closure Test a					
	Loop Closure Test b					
	Loop Closure Test c					
B. 10	Bus Voltage	VDC	27.75		28.25	
B. 11	*Cal Module Temp.	VDC	0.40		1.20	
	*RAD 2.5 VDC Bias	VDC	2.47		2.53	
	*IMU Heater Current	VDC	3.9		4.80	
	PIPA Temperature	VDC	2.0		3.0	
	*IRIG Temperature	VDC	2.37		3.70	
	120 VDC Reference	VDC	2.80		4.30	

\*Parameters not available in LEM Operational SCA,  
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JOB LEM SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ ACC
B. 11 (Cont)	2.5 VDC PCM Bias	VDC	2.47		2.53	
	3200 cps, 28V Supply	VDC	4.20		4.80	
	800 cps, 28V Supply	VDC	4.20		4.80	
B. 21	IG Servo Error SCA input (Test a)	VAC				
	IG Servo Error SCA output (Test a)	VDC				
	MG Servo Error SCA input (Test b)	VAC				
	MG Servo Error SCA output (Test b)	VDC				
	OG Servo Error SCA input (Test c)	VAC				
	OG Servo Error SCA output (Test c)	VDC				
B. 35. a	*IG TMC Channel 6	V/PP				
	*IG TMC Channel 8	V/PP	Channel 6 x 5.0 -15%		Channel 6 x 5.0 +15%	
B. 35. b	*MG TMC Channel 6	V/PP				
	*MG TMC Channel 8	V/PP	Channel 6 x 5.0 -15%		Channel 6 x 5.0 +15%	

\*Parameters not available in LEM Operational SCA,  
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JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ ACC
B. 35. c	*OG TMC Channel 6	V P/P				
	*OG TMC Channel 8	V P/P	Channel 6 x 2.75 -15%		Channel 6 x 2.75 +15%	
B. 40	*DSKY Row 1	Deg.				
	DSKY Row 2	Deg.				
	DSKY Row 3	Deg.				
B. 41	*DSKY Row 1	Deg.				
	DSKY Row 2	Deg.				
	DSKY Row 3	Deg.				
B. 41. a	*R & D 2.5 VDC Bias	VDC				
B. 42. a	*IG CDU Fine Error (PAVM)	VAC				
	*IG CDU Fine Error (DVM)	VDC				
B. 42. b	*MG CDU Fine Error (PAVM)	VAC				
	*MG CDU Fine Error (DVM)	VDC				
B. 42. c	*OG CDU Fine Error (PAVM)	VAC				
	*OG CDU Fine Error (DVM)	VDC				

\*Parameters not available in LEM Operational SCA,  
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JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ ACC
B. 46. a	*OG LX Resolver Sin $\pm 10^\circ$ (Test A) (TES 203)	VDC				
	*OG LX Resolver Sin $\pm 10^\circ$ (Test A) (XBR 142)	VAC				
B. 46. b	*IG LX Resolver Sin $\pm 10^\circ$ (Test B) (TES 204)	VDC				
	*IG LX Resolver Sin $\pm 10^\circ$ (Test B) (XBR 144)	VAC				
B. 46. c	*MG LX Resolver Sin $\pm 10^\circ$ (Test C) (TES 205)	VDC				
	*MG LX Resolver Sin $\pm 10^\circ$ (Test C) (XBR 143)	VAC				
B. 48	DSKY Row 1	Deg.				
	DSKY Row 2	Deg.				
	DSKY Row 3	Deg.				
B. 49. a	IG LX Resolver (45°) Cos (Test A) (TES 120)	VDC				
	IG LX Resolver (45°) Cos (Test A) (XBR 243)	VAC				

\*Parameters not available in LEM Operational SCA,  
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JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ/ACC
B. 49. b	MG 1X Resolver (45°) Cos (Test B) (TES 121)	VDC				
	MG 1X Resolver (45°) Cos (Test B) (XBR 242)	VAC				
	OG 1X Resolver (45°) Cos (Test C) (TES 122)	VDC				
B. 49. c	OG 1X Resolver (45°) Cos (Test C) (XBR 241)	VAC				
	IG 1X Resolver (45°) Sin (Test D) (TES 123)	VDC				
	IG 1X Resolver (45°) Sin (Test D) (XBR 144)	VAC				
B. 49. d	MG 1X Resolver (45°) Sin (Test E) (TES 124)	VDC				
	MG 1X Resolver (45°) Sin (Test E) (XBR 143)	VAC				
	OG 1X Resolver (45°) Sin (Test F) (TES 125)	VDC				

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JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ/ACC
B. 49. f (cont)	OG 1X Resolver (45°) Sin (Test F) (XBR 142)	VAC				
	DSKY Row 1 DSKY Row 2 DSKY Row 3	Deg. Deg. Deg.				
	IG 1X Resolver (135°) Cos (Test A) (TES 120)	VDC				
B. 52. a	IG 1X Resolver (135°) Cos (Test A) (XBR 243)	VAC				
	MG 1X Resolver (135°) Cos (Test B) (TES 121)	VDC				
	MG 1X Resolver (135°) Cos (Test B) (XBR 242)	VAC				
B. 52. b	OG 1X Resolver (135°) Cos (Test C) (TES 122)	VDC				
	OG 1X Resolver (135°) Cos (Test C) (XBR 241)	VAC				

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JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ/ACC
B. 52. d	IG 1X Resolver (135°) Sin (Test D) (TES 123)	VDC				
	IG 1X Resolver (135°) Sin (Test D) (XBR 144)	VAC				
	MG 1X Resolver (135°) Sin (Test E) (TES 124)	VDC				
B. 52. e	MG 1X Resolver (135°) Sin (Test E) (XBR 143)	VAC				
	OG 1X Resolver (135°) Sin (Test F) (TES 125)	VDC				
	OG 1X Resolver (135°) Sin (Test F) (XBR 142)	VAC				
B. 54	DSKY Row 1 DSKY Row 2 DSKY Row 3	Deg. Deg. Deg.				
	IG 1X Resolver (225°) Cos (Test A) (TES 120)	VDC				

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JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ/ACC
B. 55. a (cont)	IG 1X Resolver (225°) Cos (Test A) (XBR 243)	VAC				
	MG 1X Resolver (225°) Cos (Test B) (TES 121)	VDC				
	MG 1X Resolver (225°) Cos (Test B) (XBR 242)	VAC				
B. 55. b	OG 1X Resolver (225°) Cos (Test C) (TES 122)	VDC				
	OG 1X Resolver (225°) Cos (Test C) (XBR 241)	VAC				
	IG 1X Resolver (225°) Sin (Test D) (TES 123)	VDC				
B. 55. c	IG 1X Resolver (225°) Sin (Test D) (XBR 144)	VAC				
	MG 1X Resolver (225°) Sin (Test E) (TES 124)	VDC				

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JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ ACC
B. 55. e (cont)	MG IX Resolver (225°) Sin (Test E) (XBR 143)	VAC				
B. 55. f	OG IX Resolver (225°) Sin (Test F) (TES 125)	VDC				
	OG IX Resolver (225°) Sin (Test F) (XBR 142)	VAC				
B. 57	DSKY Row 1 DSKY Row 2 DSKY Row 3					
B. 58. a	IG IX Resolver (315°) Cos (Test A) (TES 120)	VDC				
	IG IX Resolver (315°) Cos (Test A) (XBR 243)	VAC				
B. 58. b	MG IX Resolver (315°) Cos (Test B) (TES 121)	VDC				
	MG IX Resolver (315°) Cos (Test B) (XBR 242)	VAC				

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JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ ACC
B. 58. c	OG IX Resolver (315°) Cos (Test C) (TES 122)	VDC				
	OG IX Resolver (315°) (Test C) (XBR 241)	VAC				
B. 58. d	IG IX Resolver (315°) Sin (Test D) (TES 123)	VDC				
	IG IX Resolver (315°) Sin (Test D) (XBR 144)	VAC				
B. 58. e	MG IX Resolver (315°) Sin (Test E) (TES 124)	VDC				
	MG IX Resolver (315°) Sin (Test E) (XBR 143)	VAC				
B. 58. f	OG IX Resolver (315°) Sin (Test F) (TES 125)	VDC				
	OG IX Resolver (315°) Sin (Test F) (XBR 142)	VAC				
B. 57	*Shaft CDU Fine Error	VDC	2.45		2.55	

\*Parameters not available in LEM Operational SCA,  
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JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ ACC
B. 66	*Shaft CDU Fine Error	VDC	3.75		4.25	
B. 72	*Trunion CDU Fine Error	VDC	3.75		4.25	
B. 73	*Trunion CDU Fine Error	VDC	2.45		2.55	
B. 79	Trunion IX Resolver Sin (TES 126)	VDC	4.45		4.95	
	Trunion IX Resolver Cos (TES 131)	VDC	4.45		4.95	
B. 82	Shaft IX Resolver Sin (TES 129)	VDC	4.45		4.95	
	Shaft IX Resolver Cos (TES 130)	VDC	4.45		4.95	
B. 86. a	Yaw Attitude Error (PAVM)	VAC				
	Yaw Attitude Error (DVM) (TES 114)	VDC				
B. 86. b	Pitch Attitude Error (PAVM)	VAC				

\*Parameters not available in LEM Operational SCA,  
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JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ ACC
B. 89. b (cont)	Pitch Attitude Error (DVM) (TES 115)	VDC				
B. 89. c	Roll Attitude Error (PAVM) Roll Attitude Error (DVM) (TES 116)	VAC				
CALCULATIONS						
C.1	SCA output (VDC) (B. 42. a) -2.5V R&D bias *IG CDU fine error = $\frac{2.00 \times \text{SCA input (VAC)} (B. 42. a)}{2.00} = 1 (420\%)$					
	SCA output (VDC) (B. 42. b) -2.5V R&D bias *MG CDU fine error = $\frac{2.00 \times \text{SCA input (VAC)} (B. 42. b)}{2.00} = 1 (420\%)$					
	SCA output (VDC) (B. 42. c) -2.5V R&D bias *OG CDU fine error = $\frac{2.00 \times \text{SCA input (VAC)} (B. 42. c)}{2.00} = 1 (420\%)$					
C.2	*CGIX resolver signal = $\frac{2 (\text{SCA output (VDC)} (B. 46. a) -2.5V PCM bias)}{2} = 1 (410\%)$ SCA input (VAC) (B. 46. a)					

\*Parameters not available in LEM Operational SCA,  
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CALCULATIONS	REJ	ACC
C.2 (cont)		
$\begin{aligned} \text{MG IX resolver sin } \pm 10^\circ &= \frac{2 \text{ (SCA output (VDC) (B. 46. c) - 2.5V PCM bias)}}{\text{SCA input (VAC) (B. 46. c)}} \\ &= 1 (\pm 10\%) \end{aligned}$		
$\begin{aligned} \text{OG IX resolver sin } \pm 10^\circ &= \frac{2 \text{ (SCA output (VDC) (B. 46. b) - 2.5V PCM bias)}}{\text{SCA input (VAC) (B. 46. b)}} \\ &= 1 (\pm 10\%) \end{aligned}$		
C.3		
$\begin{aligned} \text{IG IX resolver cos } (45^\circ) &= \frac{8.5 \text{ (SCA output (VDC) (B. 49. a) - 2.5V PCM bias)}}{\text{SCA input (VAC) (B. 49. a)}} \\ &= 1 (\pm 10\%) \end{aligned}$		
$\begin{aligned} \text{MG IX resolver cos } (45^\circ) &= \frac{8.5 \text{ (SCA output (VDC) (B. 49. b) - 2.5V PCM bias)}}{\text{SCA input (VAC) (B. 49. b)}} \\ &= 1 (\pm 10\%) \end{aligned}$		
$\begin{aligned} \text{OG IX resolver cos } (45^\circ) &= \frac{8.5 \text{ (SCA output (VDC) (B. 49. c) - 2.5V PCM bias)}}{\text{SCA input (VAC) (B. 49. c)}} \\ &= 1 (\pm 10\%) \end{aligned}$		

\*Parameters not available in LEM Operational SCA,  
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CALCULATIONS	REJ	ACC
C.3 (cont)		
$\begin{aligned} \text{IG IX resolver sin } (45^\circ) &= \frac{8.5 \text{ (SCA output (VDC) (B. 49. d) - 2.5V PCM bias)}}{\text{SCA input (VAC) (B. 49. d)}} \\ &= 1 (\pm 10\%) \end{aligned}$		
$\begin{aligned} \text{MG IX resolver sin } (45^\circ) &= \frac{8.5 \text{ (SCA output (VDC) (B. 49. e) - 2.5V PCM bias)}}{\text{SCA input (VAC) (B. 49. e)}} \\ &= 1 (\pm 10\%) \end{aligned}$		
$\begin{aligned} \text{OG IX resolver sin } (45^\circ) &= \frac{8.5 \text{ (SCA output (VDC) (B. 49. f) - 2.5V PCM bias)}}{\text{SCA input (VAC) (B. 49. f)}} \\ &= 1 (\pm 10\%) \end{aligned}$		
$\begin{aligned} \text{IG IX resolver cos } (135^\circ) &= \frac{8.5 \text{ (SCA output (VDC) (B. 52. a) - 2.5V PCM bias)}}{\text{SCA input (VAC) (B. 52. a)}} \\ &= -1 (\pm 10\%) \end{aligned}$		
$\begin{aligned} \text{MG IX resolver cos } (135^\circ) &= \frac{8.5 \text{ (SCA output (VDC) (B. 52. b) - 2.5V PCM bias)}}{\text{SCA input (VAC) (B. 52. b)}} \\ &= -1 (\pm 10\%) \end{aligned}$		

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CALCULATIONS	REJ	ACC
C.3. (cont)		
$\begin{aligned} \text{OG IX resolver cos } (135^\circ) &= \frac{8.5 \text{ (SCA output (VDC) (B. 55. c) - 2.5V PCM bias)}}{\text{SCA input (VAC) (B. 55. c)}} \\ &= -1 (\pm 10\%) \end{aligned}$		
$\begin{aligned} \text{IG IX resolver sin } (135^\circ) &= \frac{8.5 \text{ (SCA output (VDC) (B. 52. d) - 2.5V PCM bias)}}{\text{SCA input (VAC) (B. 52. d)}} \\ &= 1 (\pm 10\%) \end{aligned}$		
$\begin{aligned} \text{MG IX resolver sin } (135^\circ) &= \frac{8.5 \text{ (SCA output (VDC) (B. 52. e) - 2.5V PCM bias)}}{\text{SCA input (VAC) (B. 52. e)}} \\ &= 1 (\pm 10\%) \end{aligned}$		
$\begin{aligned} \text{OG IX resolver sin } (135^\circ) &= \frac{8.5 \text{ (SCA output (VDC) (B. 52. f) - 2.5V PCM bias)}}{\text{SCA input (VAC) (B. 52. f)}} \\ &= 1 (\pm 10\%) \end{aligned}$		
$\begin{aligned} \text{IG IX resolver cos } (225^\circ) &= \frac{8.5 \text{ (SCA output (VDC) (B. 55. a) - 2.5V PCM bias)}}{\text{SCA input (VAC) (B. 55. a)}} \\ &= -1 (\pm 10\%) \end{aligned}$		
$\begin{aligned} \text{MG IX resolver cos } (225^\circ) &= \frac{8.5 \text{ (SCA output (VDC) (B. 55. b) - 2.5V PCM bias)}}{\text{SCA input (VAC) (B. 55. b)}} \\ &= -1 (\pm 10\%) \end{aligned}$		

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CALCULATIONS	REJ	ACC
C.3 (cont)		
$\begin{aligned} \text{OG IX resolver cos } (225^\circ) &= \frac{8.5 \text{ (SCA output (VDC) (B. 55. c) - 2.5V PCM bias)}}{\text{SCA input (VAC) (B. 55. c)}} \\ &= -1 (\pm 10\%) \end{aligned}$		
$\begin{aligned} \text{IG IX resolver sin } (225^\circ) &= \frac{8.5 \text{ (SCA output (VDC) (B. 55. d) - 2.5V PCM bias)}}{\text{SCA input (VAC) (B. 55. d)}} \\ &= -1 (\pm 10\%) \end{aligned}$		
$\begin{aligned} \text{MG IX resolver sin } (225^\circ) &= \frac{8.5 \text{ (SCA output (VDC) (B. 55. e) - 2.5V PCM bias)}}{\text{SCA input (VAC) (B. 55. e)}} \\ &= -1 (\pm 10\%) \end{aligned}$		
$\begin{aligned} \text{OG IX resolver sin } (225^\circ) &= \frac{8.5 \text{ (SCA output (VDC) (B. 55. f) - 2.5V PCM bias)}}{\text{SCA input (VAC) (B. 55. f)}} \\ &= -1 (\pm 10\%) \end{aligned}$		
$\begin{aligned} \text{IG IX resolver cos } (315^\circ) &= \frac{8.5 \text{ (SCA output (VDC) (B. 58. a) - 2.5V PCM bias)}}{\text{SCA input (VAC) (B. 58. a)}} \\ &= 1 (\pm 10\%) \end{aligned}$		
$\begin{aligned} \text{MG IX resolver cos } (315^\circ) &= \frac{8.5 \text{ (SCA output (VDC) (B. 58. b) - 2.5V PCM bias)}}{\text{SCA input (VAC) (B. 58. b)}} \\ &= 1 (\pm 10\%) \end{aligned}$		

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CALCULATIONS	REJ	ACC
<p>C.3 (cont)</p> <p>OG IX resolver cos (315°) = <math>\frac{8.5 \text{ (SCA output (VDC) (B.58.c) - 2.5V PCM bias)}}{\text{SCA input (VAC) (B.58.c)}}</math></p> <p>= 1 (±10%)</p> <p>IG IX resolver sin (315°) = <math>\frac{8.5 \text{ (SCA output (VDC) (B.58.d) - 2.5V PCM bias)}}{\text{SCA input (VAC) (B.58.d)}}</math></p> <p>= -1 (±10%)</p> <p>MG IX resolver sin (315°) = <math>\frac{8.5 \text{ (SCA output (VDC) (B.58.e) - 2.5V PCM bias)}}{\text{SCA input (VAC) (B.58.e)}}</math></p> <p>= -1 (±10%)</p> <p>OG IX resolver sin (315°) = <math>\frac{8.5 \text{ (SCA output (VDC) (B.58.f) - 2.5V PCM bias)}}{\text{SCA input (VAC) (B.58.f)}}</math></p> <p>= -1 (±10%)</p>		
<p>C.4</p> <p>Yaw attitude error = <math>\frac{2.44 \text{ (SCA output (VDC) (B.59.a) - 2.5V PCM bias)}}{\text{SCA input (VAC) (B.59.a)}}</math></p> <p>= 1 (±10%)</p>		

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CALCULATIONS	REJ	ACC
<p>C.4 (cont)</p> <p>Pitch attitude error = <math>\frac{2.44 \text{ (SCA output (VDC) (B.59.b) - 2.5V PCM bias)}}{\text{SCA input (VAC) (B.59.b)}}</math></p> <p>= 1 (±10%)</p> <p>Roll attitude error = <math>\frac{2.44 \text{ (SCA output (VDC) (B.59.c) - 2.5V PCM bias)}}{\text{SCA input (VAC) (B.59.c)}}</math></p> <p>= 1 (±10%)</p> <p>C.5</p> <p>XG servo error = <math>\frac{\text{SCA output (VDC) (B.21 test a)}}{\text{SCA input (VAC) (B.21 test a)}}</math></p> <p>= 0.91 (±15%)</p> <p>MG servo error = <math>\frac{\text{SCA output (VDC) (B.21 test b)}}{\text{SCA input (VAC) (B.21 test b)}}</math></p> <p>= 0.91 (±15%)</p> <p>OG servo error = <math>\frac{\text{SCA output (VDC) (B.21 test c)}}{\text{SCA input (VAC) (B.21 test c)}}</math></p> <p>= 0.91 (±15%)</p>		

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Table II

Test	Gimbal Servo Switch Position	Test Selector Panel Position (CROSSBAR to 271)	Signal	CROSSBAR CONTROL Position (PAVM)
a	1	137	IG servo error	136
b	2	138	MG servo error	134
c	3	139	OG servo error	133

b. Record maximum motor spread of SCA input voltages on PAVM.

NOTE: The SCA output voltage will cause the DVM to alternately indicate a high value and a low value. Determine each value. Subtract lower value from higher value to obtain maximum motor spread.

c. Record maximum motor spread of SCA output voltages on DVM.

d. Press TEST STOP pushbutton on Test Selector panel; the TEST START pushbutton shall go out.

22. Press to extinguish GIMBAL SERVO TEST pushbutton.

23. Deleted

\*IG, MG, AND OG TORQUE MOTOR CURRENTS (GG2110C, 2140C, and 2170C)

\*24. Insure that AMPLITUDE control on Signal Generator is set to 0.

\*25. Connect jumper between PROBES OUTPUT DIRECT jacks and CH 6 DC IN jacks on Auxiliary Input panel.

\*26. Set OSCILLOGRAPH SELECTOR CHANNEL 6 switch on Oscillograph Signal Selector panel to AUX.

\*27. Insure that CH 6 DC indicator is lighted.

\*28. Zero oscillograph channel 6 and set gain at 0.2 v/cm. Set gain of channel 8 at 2 v/cm and zero adjust channel 8 for a centered trace with a 2.5 vdc bias input by off-setting zero line 12.5 mm to right of chart center line.

\*29. Set FREQUENCY meter on Signal Generator to 5 and RANGE switch to X10.

\*30. Set CHART DRIVE switch on Oscillograph Control panel to MM/SEC.

\*31. Set CROSSBAR CONTROL switches on Primary Signal Selector panel to 176 to monitor Signal Generator output on oscilloscope.

\*32. Press the GIMBAL SERVO TEST pushbutton. The pushbutton shall light.

\*Not applicable to LEM Operational SCA, P/N 6007013.

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\*33. Obtain oscillograph trace of torque motor currents by performing the following steps for each test listed in table III.

a. Connect PSA TPA Test Points to direct probes.

b. Set Test Selector CROSSBAR and GIMBAL SERVO TEST switches as indicated.

c. Press Test START pushbutton on Test Selector panel. The pushbutton shall light.

d. Increase Signal Generator AMPLITUDE control until the oscilloscope indicates value listed in table III for each test. Maintain Signal Generator setting for approximately 10 seconds, then return control to 0.

e. Press TEST STOP pushbutton on Test Selector panel. The pushbutton shall extinguish.

\*34. Press the GIMBAL SERVO TEST pushbutton. The pushbutton shall extinguish. Set Oscillograph pre-amps to OFF.

\*35. Set CHART DRIVE switch on Oscillograph Control panel to CM/HIT. Record peak-to-peak SCA input signal monitored on channel 6 and peak-to-peak SCA output signal monitored on channel 8.

\*IG, MG, AND OG CDU FINE ERRORS (GG2220, 2250 and 2260)

\*36. Perform following DSKY operations:

a. VERB 41 NOUN 20 ENTR

b. Observe: VERB 21 NOUN 23 Flashing

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Table III

Test	Signal Generator Output On Oscilloscope	PSA TPA Test Points		Test Selector Panel Position	GIMBAL SERVO TEST Switch Position	Signal
		High	Low			
a	2V peak-to-peak	TB2-31	TB1-49	132	1	IG torque motor curr.
b	1V peak-to-peak	TB2-32	TB1-49	133	2	MG torque motor curr.
c	1V peak-to-peak	TB1-45	TB1-49	134	3	OG torque motor curr.

a. Observe: VERB 21 NOUN 23 Flashing

b. +00100 ENTR

c. Observe: VERB 23 NOUN 23 Flashing

d. +00100 ENTR

e. Observe: VERB 23 NOUN 23 Flashing

f. +00100 ENTR

Table IV

Test Site	Latitude
MIT	+42.366
ACSP	+42.902
GAEC	+40.748
MSC	+39.556
KSC	+28.516
NAA	+33.921

\*39. Within 10 to 90 seconds following step 38, s. perform the following DSKY operations:

a. VERB 21 NOUN 01 ENTR

b. 02513 ENTR

c. 00000 ENTR

d. VERB 16 NOUN 20 ENTR

\*Not applicable to LEM Operational SCA, P/N 6007013.

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Table V

	Test Points		Selector Panel Position	Signal
	High	Low		
a	TB3-37	TB3-34	140	IG CDU fine error
b	TB3-38	TB3-34	141	MG CDU fine error
c	TB3-41	TB3-34	142	OG CDU fine error

\*43. Perform the following DSKY operations:

a. VERB 21 NOUN 01 ENTR

b. 02513 ENTR

c. 77776 ENTR

\*IG, MG, AND OG LX RESOLVER SIN ±10 DEGREES (GG2121, 2151, and 2181)

\*44. Perform following DSKY operations:

a. VERB 41 NOUN 20 ENTR

b. Observe: VERB 21 NOUN 23 Flashing

c. +01000 ENTR

d. Observe: VERB 23 NOUN 23 Flashing

e. +01000 ENTR

f. Observe: VERB 23 NOUN 23 Flashing

g. +01000 ENTR

\*45. On DSKY, enter V16 N20 ENTR and verify that contents of R<sub>1</sub>, R<sub>2</sub>, and R<sub>3</sub> are approximately 01000.

\*46. Alternately connect SCA input and SCA output to DVM by setting Test Selector panel and CROSSBAR CONTROL switches to positions listed in table VI. For each test, perform following operations:

a. Set CROSSBAR CONTROL switches to 271.

b. Set Test Selector panel to position listed in table VI and record SCA output indicated on DVM.

c. Set CROSSBAR CONTROL switches to position listed in table VI and record SCA input indicated on DVM.

Table VI

Test	CROSSBAR CONTROL Position	Test Selector Panel Position	Signal
a	142	203	OG LX resolver sin ±10°
b	144	204	IG LX resolver sin ±10°
c	143	205	MG LX resolver sin ±10°

IG, MG, AND OG LX RESOLVER SIN AND COS

\*47. Perform following DSKY operations:

a. VERB 41 NOUN 20 ENTR

b. Observe: VERB 21 NOUN 23 Flashing

c. +04500 ENTR

d. Observe: VERB 22 NOUN 23 Flashing

e. +04500 ENTR

\*Not applicable to LEM Operational SCA, P/N 6007013

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f. Observe:			50. Perform following DSKY operations:
VERB 23	NOUN 23	Flashing	a. VERB 41 NOUN 20 ENTR
g. +04500		ENTR	b. Observe:
h. VERB 16	NOUN 20	ENTR	VERB 21 NOUN 22 Flashing
48. Monitor and record the contents of R <sub>1</sub> , R <sub>2</sub> , and R <sub>3</sub> .			c. +13500
49. Alternately connect SCA output and SCA input to DVM for each test listed in table VII. For each test, perform following operations:			d. Observe:
a. Set CROSSBAR CONTROL switches to 271.			VERB 22 NOUN 22 Flashing
b. Set Test Selector panel to position listed in table VII and record SCA output indicated on DVM.			e. +13500
c. Immediately set CROSSBAR CONTROL to position listed in table VII and record SCA input indicated on DVM.			f. Observe:
			VERB 23 NOUN 22 Flashing
			g. +13500
			h. Observe:
			VERB 16 NOUN 20 ENTR
			51. Monitor and record the contents of R <sub>1</sub> , R <sub>2</sub> , and R <sub>3</sub> .
			52. Repeat step 49.
			53. Perform following DSKY operations:
			a. VERB 41 NOUN 20 ENTR
			b. Observe:
			VERB 21 NOUN 23 Flashing
			c. +22500
			d. Observe:
			VERB 23 NOUN 22 Flashing
			e. +22500
			f. Observe:
			VERB 23 NOUN 23 Flashing
			g. +22500
			h. VERB 16 NOUN 20 ENTR
			54. Monitor and record the contents of R <sub>1</sub> , R <sub>2</sub> , and R <sub>3</sub> .
			55. Repeat step 49.
			56. Perform following DSKY operations:
			a. VERB 41 NOUN 20 ENTR

Test	CROSSBAR CONTROL Position	Test Selector Panel Position	Signal
a	243	120	IG IX resolver cos (GG2113V)
b	243	121	MG IX resolver cos (GG2143V)
c	241	122	OG IX resolver cos (GG2173V)
d	144	123	IG IX resolver sin (GG2112V)
e	143	124	MG IX resolver sin (GG2143V)
f	143	125	OG IX resolver sin (GG2172V)

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h. VERB 21 NOUN 23 Flashing			4. Connect jumper from Decade Error Bridge (DEB) front panel OUTPUT Jacks to DEB front panel SIGNAL INPUT Jacks.
c. +31500			5. Turn 800 ~ REFERENCE INPUT VOLTAGE switch on DEB from OFF to 80V. POWER indicator shall light.
4. Observe:			6. Press the Resolver Circuit Tester Control Panel POWER ON pushbutton. POWER ON, READ MODE and MON COARSE or MON FINE indicators shall light.
VERB 23 NOUN 23 Flashing			7. Select one of 3 operating channels (IG, MG or OG select) and verify the two LORS switches (READ RATE TABLE INPUT and LORS RATE TABLE CONTROL) are deenergized.
c. +31500			8. READ MODE/SET MODE shall be placed in SET MODE position.
h. VERB 16 NOUN 20 ENTR			9. If MON COARSE indicator is not lit, press MON COARSE pushbutton. MON COARSE indicator shall light.
57. Monitor and record the contents of R <sub>1</sub> , R <sub>2</sub> , and R <sub>3</sub> .			10. Determine that REFERENCE QUADRANT VERNIER dial is set to 0°, and REFERENCE QUADRANT switch is set to 0° - 90°.
58. Repeat step 49.			11. Determine that DEB DEGREES dial is set to 0°.
59. Perform following DSKY operations:			12. Rotate RESOLVER ANGLE TRANSMITTER control and observe null meter. When null meter deflects right (+) while rotating RESOLVER ANGLE TRANSMITTER control CW, the IX or coarse resolver is at one of its two nulls.
a. VERB 41 NOUN 20 ENTR			13. Press MON FINE pushbutton. MON
b. Observe:			
VERB 21 NOUN 23 Flashing			
c. +00000			
4. Observe:			
VERB 23 NOUN 23 Flashing			
e. +00000			
f. Observe:			
VERB 23 NOUN 23 Flashing			
g. +00000			
RR SHAFT AND TRUNNION FINE ERROR (GG3311V and 3321V)			
60. Resolver Circuit Tester Preparation (RCT)			
a. Set all Decade Error Bridge switches and controls to OFF, minimum or zero.			
b. Connect cable W173 to CBE distribution box (GDB).			
c. Connect RCT power cable to facility 115 vac power.			

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FINE indicator lights. Rotate RESOLVER ANGLE TRANSMITTER control and observe null meter. When null meter deflects right (+) while rotating the RESOLVER ANGLE TRANSMITTER control CW, the IX or fine resolver is at one of its 32 nulls. When both coarse and fine resolvers are at the correct null (zero) meter will deflect right (+) when the RESOLVER ANGLE TRANSMITTER control is rotated CW (increasing angle).			NOTE: G/N CAUTION lamp on the Monitor Panel and PROG alarm lamp on the DSKY will light during performance of steps 64 through 73. Ignore the lamp indications.
a. Select MON COARSE.			65. Perform following DSKY operations:
o. With the SENSITIVITY control fully CCW, set the REFERENCE QUADRANT switch to 90° - 180° and set DEB DEGREES dial to 90°.			a. VERB 40 NOUN 40 ENTR
p. Null meter using REFERENCE QUADRANT VERNIER control. Leave the REFERENCE QUADRANT VERNIER control in this position for all following tests.			b. VERB 21 NOUN 10 ENTR
q. Set REFERENCE QUADRANT switch to 90° - 90°.			c. 00012
61. Set RESOLVER ANGLE TRANSMITTER control to 0.			d. 00011
62. Press READ MODE/SET MODE pushbutton to light SET MODE indicator.			66. Monitor SCA input on PAVM by connecting PBA TPA buffered probe to TBS-33 (4a) and TBS-34 (4c) and connecting a jumper between PROBES OUTPUT BUFFERED Jacks and PAVM IN Jacks on Auxiliary Input Panel.
63. Press SHAFT SELECT/SET ENABLE pushbutton. Both halves of pushbutton will light.			Set PAVM Crossbar Control switch on Primary Signal Selector panel to AUX.
64. Connect shaft CDU fine error output from SCA to DVM by setting Test Selector panel to 146.			67. Adjust RESOLVER ANGLE TRANSMITTER control to produce a minimum total voltage signal on PAVM. Record DVM indication.
			68. Adjust RESOLVER ANGLE TRANSMITTER control until the in-phase voltage on the PAVM is +720 mv. Record the DVM indication.
			69. Press TRUN SELECT/SET ENABLE pushbutton. Both halves of pushbutton will light.
			70. Connect trunnion CDU fine error output from SCA to DVM by setting Test Selector panel to 147.

\*Not applicable to LEM Operational SCA, P/N 6007013.

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71. Remove PBA TPA buffered probe from TBS-33 (4a) and connect to TBS-36 (4b).			h. DEB/RCT - adjust RESOLVER ANGLE TRANSMITTER and SENSITIVITY controls to achieve best null on most sensitive coarse scale.
72. Adjust RESOLVER ANGLE TRANSMITTER control until in-phase voltage on the PAVM is +720 mv. Record the DVM indication.			l. DEB - SENSITIVITY to fully CCW.
73. Adjust RESOLVER ANGLE TRANSMITTER control until PAVM indicates minimum total voltage signal. Record DVM indication.			j. RCT - MON FINE to lighted.
74. Perform following DSKY operations:			k. DEB - DEGREES to 0 + 00000.
a. VERB 21 NOUN 10 ENTR			l. DEB/RCT - adjust RESOLVER ANGLE TRANSMITTER and SENSITIVITY controls to achieve best null on most sensitive fine scale.
b. 00012			m. DEB - SENSITIVITY to fully CCW.
c. 00010			n. RCT - remove switch setting from step 6.
RR SHAFT AND TRUNNION IX RESOLVER SIN AND COS			77. Press TRUN SELECT/SET ENABLE pushbutton on Resolver Circuit Tester Control panel. Both halves of pushbutton will light.
NOTE: G/N CAUTION lamp on the Monitor panel and PROG alarm lamp on the DSKY will light during performance of steps 75 through 86. Ignore the lamp indications.			78. Enter VERB 04 NOUN 40 into DSKY and press ENTR pushbutton. Verify on DSKY that contents of R <sub>1</sub> is approximately 04500 and R <sub>2</sub> is approximately 00000.
75. Perform following DSKY operations:			79. Set Test Selector panel to following positions. At each position, record SCA output of following signals on DVM:
VERB 36 ENTR			Test Selector Panel Position Signal
VERB 40 NOUN 40 ENTR			128 Transducer IX resolver sin (GG3324V)
76. Set the following switches on the DEB and RCT control panel:			131 Transducer IX resolver cos (GG3325V)
a. DEB - REFERENCE QUADRANT to 00 - 90°.			80. Press SHAFT SELECT/SET ENABLE pushbutton on Resolver Circuit Tester Control panel. Both halves of pushbutton will light.
b. DEB - SENSITIVITY to fully CCW.			
c. RCT - perform step 60g.			
d. RCT - SET MODE to lighted.			
e. DEB - DEGREES to 45.000.			
f. RCT - MON COARSE to lighted.			
g. RCT - RESOLVER ANGLE TRANSMITTER to 45.000.			

\*Not applicable to LEM Operational SCA, P/N 6007013.

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ASSY

91. Enter VERB 06 NOUN 40 into DSKY and press ENTR pushbutton. Verify on DSKY that contents of  $R_1$  is approximately 00000 and  $R_2$  is approximately 04500.

92. Set Test Selector panel to following positions. At each position, record SCA output of following signals on DVM:

Test Selector Panel Position	Signal
129	Shaft 1X resolver sin (GG3304V)
130	Shaft 1X resolver cos (GG3305V)

93. Set RESOLVER ANGLE TRANSMITTER control to 0.

94. Set 800~ REFERENCE INPUT VOLTAGE switch on Decade Error Bridge panel to OFF.

YAW, PITCH, AND ROLL ATTITUDE ERROR (GG3249V, 2219V and 2279V)

95. Perform following DSKY operations:

- VERB 36 ENTR
- VERB 41 NOUN 20 ENTR
- Observe: VERB 21 NOUN 22 Flashing ENTR
- Observe: VERB 22 NOUN 22 Flashing ENTR
- Observe: VERB 23 NOUN 22 Flashing ENTR
- Observe: VERB 24 NOUN 22 Flashing ENTR
- Observe: VERB 25 NOUN 22 Flashing ENTR
- Observe: VERB 26 NOUN 22 Flashing ENTR

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ASSY

91. Press POWER OFF on Resolver Circuit Tester Control Panel.

92. Disconnect cable W173 from ODB.

Table VIII

Test	PBA TPA Test Points		Test Selector Panel Position	Signal
	High	Low		
a	TB4-43	TB4-47	114	Yaw attitude error
b	TB4-45	TB4-49	115	Pitch attitude error
c	TB4-44	TB4-48	116	Roll attitude error

## C. CALCULATIONS

1. Perform following CDU fine error calculations:

$$a. \text{ IG CDU fine error} = \frac{\text{SCA output (VDC)} - 2.5V \text{ R\&D bias}}{2.00 \times \text{SCA input (VAC)}} = 1 (\pm 0.2\%)$$

$$b. \text{ MG CDU fine error} = \frac{\text{SCA output (VDC)} - 2.5V \text{ R\&D bias}}{2.00 \times \text{SCA input (VAC)}} = 1 (\pm 0.2\%)$$

$$c. \text{ OG CDU fine error} = \frac{\text{SCA output (VDC)} - 2.5V \text{ R\&D bias}}{2.00 \times \text{SCA input (VAC)}} = 1 (\pm 0.2\%)$$

2. Perform following 1X resolver sin  $\pm 10^\circ$  degree calculations:

$$a. \text{ OG 1X resolver sin } \pm 10^\circ = \frac{2 (\text{SCA output (VDC)} - 2.5V \text{ PCM bias})}{\text{SCA input (VAC)}} = 1 (\pm 10\%)$$

$$b. \text{ MG 1X resolver sin } \pm 10^\circ = \frac{2 (\text{SCA output (VDC)} - 2.5V \text{ PCM bias})}{\text{SCA input (VAC)}} = 1 (\pm 10\%)$$

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$$c. \text{ IG 1X resolver sin } \pm 10^\circ = \frac{2 (\text{SCA output (VDC)} - 2.5V \text{ PCM bias})}{\text{SCA input (VAC)}} = 1 (\pm 10\%)$$

3. Perform following 1X resolver cos and sin calculations:

$$a. \text{ IG 1X resolver cos} = \frac{8.5 (\text{SCA output (VDC)} - 2.5V \text{ PCM bias})}{\text{SCA input (VAC)}} = 1 (\pm 10\%)$$

$$b. \text{ MG 1X resolver cos} = \frac{8.5 (\text{SCA output (VDC)} - 2.5V \text{ PCM bias})}{\text{SCA input (VAC)}} = 1 (\pm 10\%)$$

$$c. \text{ OG 1X resolver cos} = \frac{8.5 (\text{SCA output (VDC)} - 2.5V \text{ PCM bias})}{\text{SCA input (VAC)}} = 1 (\pm 10\%)$$

$$d. \text{ IG 1X resolver sin} = \frac{8.5 (\text{SCA output (VDC)} - 2.5V \text{ PCM bias})}{\text{SCA input (VAC)}} = 1 (\pm 10\%)$$

$$e. \text{ MG 1X resolver sin} = \frac{8.5 (\text{SCA output (VDC)} - 2.5V \text{ PCM bias})}{\text{SCA input (VAC)}} = 1 (\pm 10\%)$$

$$f. \text{ OG 1X resolver sin} = \frac{8.5 (\text{SCA output (VDC)} - 2.5V \text{ PCM bias})}{\text{SCA input (VAC)}} = 1 (\pm 10\%)$$

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ASSY

4. Perform following attitude error calculations:

$$a. \text{ Yaw attitude error} = \frac{2.44 (\text{SCA output (VDC)} - 2.5V \text{ PCM bias})}{\text{SCA input (VAC)}} = 1 (\pm 10\%)$$

$$b. \text{ Pitch attitude error} = \frac{2.44 (\text{SCA output (VDC)} - 2.5V \text{ PCM bias})}{\text{SCA input (VAC)}} = 1 (\pm 10\%)$$

$$c. \text{ Roll attitude error} = \frac{2.44 (\text{SCA output (VDC)} - 2.5V \text{ PCM bias})}{\text{SCA input (VAC)}} = 1 (\pm 10\%)$$

5. Perform the following servo error calculations:

$$a. \text{ IG servo error} = \frac{\text{SCA output (VDC)}}{\text{SCA input (VAC)}} = 0.91 (\pm 15\%)$$

$$b. \text{ MG servo error} = \frac{\text{SCA output (VDC)}}{\text{SCA input (VAC)}} = 0.91 (\pm 15\%)$$

$$c. \text{ OG servo error} = \frac{\text{SCA output (VDC)}}{\text{SCA input (VAC)}} = 0.91 (\pm 15\%)$$

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REV. H  
INITIAL TORR 32757

ASSEMBLY UNDER TEST		TEST HISTORY	
TITLE	DATE	START	END
SER. NO.	DWG	REV.	SITE / LOCATION
MAJOR GROUND SUPPORT EQUIPMENT		TIME	TOTAL ELAPSED
NAME	SER. NO.	NAME	SER. NO.
NAME	SER. NO.	NAME	SER. NO.
CONDUCTED BY		APPROVED BY	
NAME / AFFILIATION		NAME / AFFILIATION	

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ/ACC
A.10	Bus Voltage	VDC	27.00		29.00	
B.2	28 VDC LOC Operate	VDC	3.9		4.8	
	28 VDC IMU Standby	VDC	3.9		4.8	
B.9	Loop Closure Test a					
	Loop Closure Test b					
	Loop Closure Test c					
B.10	Bus Voltage	VDC	27.75		28.25	
B.11	*Cal Module Temp.	VDC	0.40		1.26	
	*R&D 1.5 VDC Bias	VDC	2.47		2.53	
	*IMU Header Current	VDC	3.9		4.90	
	*PIPA Temperature	VDC	2.0		3.0	
	*TRIG Temperature	VDC	2.37		3.70	
	130 VDC Reference	VDC	2.80		4.90	

\*Parameters not available in LEM Operational SCA.  
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JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ/ACC
B.11 (Cont)	2.5 VDC PCM Bias	VDC	2.47		2.53	
	3200 cps, 28V Supply	VDC	4.20		4.90	
	800 cps, 28V Supply	VDC	4.20		4.90	
B.21	IG Servo Error SCA Input (Test a)	VAC				
	IG Servo Error SCA output (Test a)	VDC				
	MG Servo Error SCA Input (Test b)	VAC				
	MG Servo Error SCA output (Test b)	VDC				
	OG Servo Error SCA Input (Test c)	VAC				
	OG Servo Error SCA output (Test c)	VDC				
B.35.a	*IG TMC Channel 6	V/PP				
	*IG TMC Channel 8	V/PP	Channel 6 x 5.0 -15%		Channel 8 x 5.0 +15%	
B.35.b	*MG TMC Channel 6	V/PP				
	*MG TMC Channel 8	V/PP	Channel 6 x 5.0 -15%		Channel 8 x 5.0 +15%	

\*Parameters not available in LEM Operational SCA.  
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JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ/ACC
B.35.c	*OG TMC Channel 6	V P/P				
	*OG TMC Channel 8	V P/P	Channel 6 x 2.75 -15%		Channel 8 x 2.75 +15%	
B.40	*DSKY Row 1	Deg.				
	DSKY Row 2	Deg.				
	DSKY Row 3	Deg.				
B.41	*DSKY Row 1	Deg.				
	DSKY Row 2	Deg.				
	DSKY Row 3	Deg.				
B.41.a	*R & D 2.5 VDC Bias	VDC				
B.42.a	*IG CDU Fine Error (PAVM)	VAC				
	*IG CDU Fine Error (DVM)	VDC				
B.42.b	*MG CDU Fine Error (PAVM)	VAC				
	*MG CDU Fine Error (DVM)	VDC				
B.42.c	*OG CDU Fine Error (PAVM)	VAC				
	*OG CDU Fine Error (DVM)	VDC				

\*Parameters not available in LEM Operational SCA.  
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JOB LEM SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

JOC  
NO. 12620  
REV. II

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ/ACC
B.46.a	*OG 1X Resolver Sin $\pm 10^\circ$ (Test A) (TES 203)	VDC				
	*OG 1X Resolver Sin $\pm 10^\circ$ (Test A) (XBR 142)	VAC				
B.46.b	*IG 1X Resolver Sin $\pm 10^\circ$ (Test B) (TES 204)	VDC				
	*IG 1X Resolver Sin $\pm 10^\circ$ (Test B) (XBR 144)	VAC				
B.46.c	*MG 1X Resolver Sin $\pm 10^\circ$ (Test C) (TES 205)	VDC				
	*MG 1X Resolver Sin $\pm 10^\circ$ (Test C) (XBR 143)	VAC				
B.48	DSKY Row 1 Deg.	Deg.				
	DSKY Row 2 Deg.	Deg.				
	DSKY Row 3 Deg.	Deg.				
B.49.a	IG 1X Resolver (45°) Cos (Test A) (TES 120)	VDC				
	IG 1X Resolver (45°) Cos (Test A) (XBR 243)	VAC				

\*Parameters not available in LEM Operational SCA.  
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JDC  
NO. 12620  
REV. H

JOB LEM SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ/ACC
B. 49. b	MG IX Resolver (45°) Cos (Test B) (TES 121)	VDC				
	MG IX Resolver (45°) Cos (Test B) (XBR 242)	VAC				
	OG IX Resolver (45°) Cos (Test C) (TES 122)	VDC				
B. 49. c	OG IX Resolver (45°) Cos (Test C) (XBR 241)	VAC				
	IG IX Resolver (45°) Sin (Test D) (TES 123)	VDC				
	IG IX Resolver (45°) Sin (Test D) (XBR 144)	VAC				
B. 49. d	MG IX Resolver (45°) Sin (Test B) (TES 124)	VDC				
	MG IX Resolver (45°) Sin (Test B) (XBR 143)	VAC				
	OG IX Resolver (45°) Sin (Test F) (TES 125)	VDC				

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JDC  
NO. 12620  
REV. H

JOB LEM SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ/ACC
B. 49. f (cont)	OG IX Resolver (45°) Sin (Test F) (XBR 142)	VAC				
	DSKY Row 1 DSKY Row 2 DSKY Row 3	Deg. Deg. Deg.				
B. 52. a	IG IX Resolver (135°) Cos (Test A) (TES 120)	VDC				
	IG IX Resolver (135°) Cos (Test A) (XBR 243)	VAC				
	MG IX Resolver (135°) Cos (Test B) (TES 121)	VDC				
B. 52. b	MG IX Resolver (135°) Cos (Test B) (XBR 242)	VAC				
	OG IX Resolver (135°) Cos (Test C) (TES 122)	VDC				
	OG IX Resolver (135°) Cos (Test C) (XBR 241)	VAC				

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JDC  
NO. 12620  
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JOB LEM SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ/ACC
B. 52. d	IG IX Resolver (135°) Sin (Test D) (TES 123)	VDC				
	IG IX Resolver (135°) Sin (Test D) (XBR 144)	VAC				
	MG IX Resolver (135°) Sin (Test E) (TES 124)	VDC				
B. 52. e	MG IX Resolver (135°) Sin (Test E) (XBR 143)	VAC				
	OG IX Resolver (135°) Sin (Test F) (TES 125)	VDC				
	OG IX Resolver (135°) Sin (Test F) (XBR 142)	VAC				
B. 54	DSKY Row 1 DSKY Row 2 DSKY Row 3	Deg. Deg. Deg.				
	IG IX Resolver (225°) Cos (Test A) (TES 120)	VDC				

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JDC  
NO. 12620  
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JOB LEM SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ/ACC
B. 55. a (cont)	IG IX Resolver (225°) Cos (Test A) (XBR 243)	VAC				
	MG IX Resolver (225°) Cos (Test B) (TES 121)	VDC				
	MG IX Resolver (225°) Cos (Test B) (XBR 242)	VAC				
B. 55. b	OG IX Resolver (225°) Cos (Test C) (TES 122)	VDC				
	OG IX Resolver (225°) Cos (Test C) (XBR 241)	VAC				
	IG IX Resolver (225°) Sin (Test D) (TES 123)	VDC				
B. 55. d	IG IX Resolver (225°) Sin (Test D) (XBR 144)	VAC				
	MG IX Resolver (225°) Sin (Test E) (TES 124)	VDC				

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EQUIPMENT TEST  
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JDC  
NO. 12620  
REV. H

JOB LEM SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ/ACC
B. 55.e (cont)	MG IX Resolver (315°) Sin (Test E) (XBR 143)	VAC				
B. 55.f	OG IX Resolver (225°) Sin (Test F) (TES 125)	VDC				
	OG IX Resolver (225°) Sin (Test F) (XBR 142)	VAC				
B. 57	DSKY Row 1					
	DSKY Row 2					
	DSKY Row 3					
B. 55.a	IG IX Resolver (315°) Cos (Test A) (TES 120)	VDC				
	IG IX Resolver (315°) Cos (Test A) (XBR 243)	VAC				
B. 55.b	MG IX Resolver (315°) Cos (Test B) (TES 121)	VDC				
	MG IX Resolver (315°) Cos (Test B) (XBR 242)	VAC				

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JDC  
NO. 12620  
REV. H

JOB LEM SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ/ACC
B. 55.c	OG IX Resolver (315°) Cos (Test C) (TES 122)	VDC				
	OG IX Resolver (315°) (Test C) (XBR 241)	VAC				
B. 55.d	IG IX Resolver (315°) Sin (Test D) (TES 123)	VDC				
	IG IX Resolver (315°) Sin (Test D) (XBR 144)	VAC				
B. 55.e	MG IX Resolver (315°) Sin (Test E) (TES 124)	VDC				
	MG IX Resolver (315°) Sin (Test E) (XBR 143)	VAC				
B. 55.f	OG IX Resolver (315°) Sin (Test F) (TES 125)	VDC				
	OG IX Resolver (315°) Sin (Test F) (XBR 142)	VAC				
B. 57	*Shaft CDU Fine Error	VDC	2.45		2.55	

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\*Parameters not available in LEM Operational SCA,  
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JOB LEM SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ/ACC
B. 65	*Shaft CDU Fine Error	VDC	3.75		4.25	
B. 72	*Trunnion CDU Fine Error	VDC	3.75		4.25	
B. 73	*Trunnion CDU Fine Error	VDC	2.45		2.55	
B. 79	Trunnion IX Resolver Sin (TES 126)	VDC	4.45		4.95	
	Trunnion IX Resolver Cos (TES 131)	VDC	4.45		4.95	
B. 82	Shaft IX Resolver Sin (TES 129)	VDC	4.45		4.95	
	Shaft IX Resolver Cos (TES 130)	VDC	4.45		4.95	
B. 85.a	Yaw Attitude Error (PAVM)	VAC				
	Yaw Attitude Error (DVM) (TES 114)	VDC				
B. 85.b	Pitch Attitude Error (PAVM)	VAC				

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JOB LEM SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ/ACC
B. 89.b (cont)	Pitch Attitude Error (DVM) (TES 115)	VDC				
B. 89.c	Roll Attitude Error (PAVM)	VAC				
	Roll Attitude Error (DVM) (TES 116)	VDC				
C. 1 CALCULATIONS						
*IG CDU fine error = $\frac{\text{SCA output (VDC) (B. 42. a) - 2.5V R\&D bias}}{2.00 \times \text{SCA input (VAC) (B. 42. a)}} = 1 (400\%)$						
*MG CDU fine error = $\frac{\text{SCA output (VDC) (B. 42. b) - 2.5V R\&D bias}}{2.00 \times \text{SCA input (VAC) (B. 42. b)}} = 1 (400\%)$						
*OG CDU fine error = $\frac{\text{SCA output (VDC) (B. 42. c) - 2.5V R\&D bias}}{2.00 \times \text{SCA input (VAC) (B. 42. c)}} = 1 (400\%)$						
C. 2						
*OGIX resolver sin A/D = $\frac{2 (\text{SCA output (VDC) (B. 46. a) - 2.5V PCM bias})}{1 + \text{SCA input (VAC) (B. 46. a)}} = 1 (410\%)$						

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\*Parameters not available in LEM Operational SCA,  
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CALCULATIONS	REJ	ACC
C. 2 (cont)		
$\text{MG IX resolver sin } \pm 10^\circ = \frac{2 \text{ (SCA output (VDC) (B. 46. c) - 2.5V PCM bias)}}{\text{SCA input (VAC) (B. 46. c)}}$ $= 1 (\pm 10\%)$		
$\text{IG IX resolver sin } \pm 10^\circ = \frac{2 \text{ (SCA output (VDC) (B. 46. b) - 2.5V PCM bias)}}{\text{SCA input (VAC) (B. 46. b)}}$ $= 1 (\pm 10\%)$		
C. 3		
$\text{IG IX resolver cos } (45^\circ) = \frac{8.5 \text{ (SCA output (VDC) (B. 49. a) - 2.5V PCM bias)}}{\text{SCA input (VAC) (B. 49. a)}}$ $= 1 (\pm 10\%)$		
$\text{MG IX resolver cos } (45^\circ) = \frac{8.5 \text{ (SCA output (VDC) (B. 49. b) - 2.5V PCM bias)}}{\text{SCA input (VAC) (B. 49. b)}}$ $= 1 (\pm 10\%)$		
$\text{OG IX resolver cos } (45^\circ) = \frac{8.5 \text{ (SCA output (VDC) (B. 49. c) - 2.5V PCM bias)}}{\text{SCA input (VAC) (B. 49. c)}}$ $= 1 (\pm 10\%)$		

\*Parameters not available in LEM Operational SCA,  
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JOB LEM SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

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CALCULATIONS	REJ	ACC
C. 3 (cont)		
$\text{IG IX resolver sin } (45^\circ) = \frac{8.5 \text{ (SCA output (VDC) (B. 49. d) - 2.5V PCM bias)}}{\text{SCA input (VAC) (B. 49. d)}}$ $= 1 (\pm 10\%)$		
$\text{MG IX resolver sin } (45^\circ) = \frac{8.5 \text{ (SCA output (VDC) (B. 49. e) - 2.5V PCM bias)}}{\text{SCA input (VAC) (B. 49. e)}}$ $= 1 (\pm 10\%)$		
$\text{OG IX resolver sin } (45^\circ) = \frac{8.5 \text{ (SCA output (VDC) (B. 49. f) - 2.5V PCM bias)}}{\text{SCA input (VAC) (B. 49. f)}}$ $= 1 (\pm 10\%)$		
$\text{IG IX resolver cos } (135^\circ) = \frac{8.5 \text{ (SCA output (VDC) (B. 52. a) - 2.5V PCM bias)}}{\text{SCA input (VAC) (B. 52. a)}}$ $= -1 (\pm 10\%)$		
$\text{MG IX resolver cos } (135^\circ) = \frac{8.5 \text{ (SCA output (VDC) (B. 52. b) - 2.5V PCM bias)}}{\text{SCA input (VAC) (B. 52. b)}}$ $= -1 (\pm 10\%)$		

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JDC  
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CALCULATIONS	REJ	ACC
C. 3. (cont)		
$\text{OG IX resolver cos } (135^\circ) = \frac{8.5 \text{ (SCA output (VDC) (B. 52. c) - 2.5V PCM bias)}}{\text{SCA input (VAC) (B. 52. c)}}$ $= -1 (\pm 10\%)$		
$\text{IG IX resolver sin } (135^\circ) = \frac{8.5 \text{ (SCA output (VDC) (B. 52. d) - 2.5V PCM bias)}}{\text{SCA input (VAC) (B. 52. d)}}$ $= 1 (\pm 10\%)$		
$\text{MG IX resolver sin } (135^\circ) = \frac{8.5 \text{ (SCA output (VDC) (B. 52. e) - 2.5V PCM bias)}}{\text{SCA input (VAC) (B. 52. e)}}$ $= 1 (\pm 10\%)$		
$\text{OG IX resolver sin } (135^\circ) = \frac{8.5 \text{ (SCA output (VDC) (B. 52. f) - 2.5V PCM bias)}}{\text{SCA input (VAC) (B. 52. f)}}$ $= 1 (\pm 10\%)$		
$\text{IG IX resolver cos } (225^\circ) = \frac{8.5 \text{ (SCA output (VDC) (B. 55. a) - 2.5V PCM bias)}}{\text{SCA input (VAC) (B. 55. a)}}$ $= -1 (\pm 10\%)$		
$\text{MG IX resolver cos } (225^\circ) = \frac{8.5 \text{ (SCA output (VDC) (B. 55. b) - 2.5V PCM bias)}}{\text{SCA input (VAC) (B. 55. b)}}$ $= -1 (\pm 10\%)$		

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JDC  
NO. 12620  
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CALCULATIONS	REJ	ACC
C. 3 (cont)		
$\text{OG IX resolver cos } (225^\circ) = \frac{8.5 \text{ (SCA output (VDC) (B. 55. c) - 2.5V PCM bias)}}{\text{SCA input (VAC) (B. 55. c)}}$ $= -1 (\pm 10\%)$		
$\text{IG IX resolver sin } (225^\circ) = \frac{8.5 \text{ (SCA output (VDC) (B. 55. d) - 2.5V PCM bias)}}{\text{SCA input (VAC) (B. 55. d)}}$ $= -1 (\pm 10\%)$		
$\text{MG IX resolver sin } (225^\circ) = \frac{8.5 \text{ (SCA output (VDC) (B. 55. e) - 2.5V PCM bias)}}{\text{SCA input (VAC) (B. 55. e)}}$ $= -1 (\pm 10\%)$		
$\text{OG IX resolver sin } (225^\circ) = \frac{8.5 \text{ (SCA output (VDC) (B. 55. f) - 2.5V PCM bias)}}{\text{SCA input (VAC) (B. 55. f)}}$ $= -1 (\pm 10\%)$		
$\text{IG IX resolver cos } (315^\circ) = \frac{8.5 \text{ (SCA output (VDC) (B. 56. a) - 2.5V PCM bias)}}{\text{SCA input (VAC) (B. 56. a)}}$ $= 1 (\pm 10\%)$		
$\text{MG IX resolver cos } (315^\circ) = \frac{8.5 \text{ (SCA output (VDC) (B. 56. b) - 2.5V PCM bias)}}{\text{SCA input (VAC) (B. 56. b)}}$ $= 1 (\pm 10\%)$		

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JOB LEM SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

JDC  
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CALCULATIONS	REJ	ACC
C.3 (cont)		
OG 1X resolver cos (315°) = $\frac{8.5 \text{ (SCA output (VDC) (B.58.c) -2.5V PCM bias)}}{\text{SCA input (VAC) (B.58.c)}}$ = 1 (±10%)		
IG 1X resolver sin (315°) = $\frac{8.5 \text{ (SCA output (VDC) (B.58.d) -2.5V PCM bias)}}{\text{SCA input (VAC) (B.58.d)}}$ = -1 (±10%)		
MG 1X resolver sin (315°) = $\frac{8.5 \text{ (SCA output (VDC) (B.58.e) -2.5V PCM bias)}}{\text{SCA input (VAC) (B.58.e)}}$ = -1 (±10%)		
OG 1X resolver sin (315°) = $\frac{8.5 \text{ (SCA output (VDC) (B.58.f) -2.5V PCM bias)}}{\text{SCA input (VAC) (B.58.f)}}$ = -1 (±10%)		
C.4		
Yaw attitude error = $\frac{2.44 \text{ (SCA output (VDC) (B.89.a) -2.5V PCM bias)}}{\text{SCA input (VAC) (B.89.a)}}$ = 1 (±10%)		

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JOB LEM SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

JDC  
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CALCULATIONS	REJ	ACC
C.4 (cont)		
Pitch attitude error = $\frac{2.44 \text{ (SCA output (VDC) (B.89.b) -2.5V PCM bias)}}{\text{SCA input (VAC) (B.89.b)}}$ = 1 (±10%)		
Roll attitude error = $\frac{2.44 \text{ (SCA output (VDC) (B.89.c) -2.5V PCM bias)}}{\text{SCA input (VAC) (B.89.c)}}$ = 1 (±10%)		
C.5		
IG servo error = $\frac{\text{SCA output (VDC) (B.21 test a)}}{\text{SCA input (VAC) (B.21 test a)}}$ = 0.91 (±1%)		
MG servo error = $\frac{\text{SCA output (VDC) (B.21 test b)}}{\text{SCA input (VAC) (B.21 test b)}}$ = 0.91 (±1%)		
OG servo error = $\frac{\text{SCA output (VDC) (B.21 test c)}}{\text{SCA input (VAC) (B.21 test c)}}$ = 0.91 (±1%)		

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SUBSYSTEM LEM G & N SYSTEM  
DESCRIPTION This JDC provides a functional checkout procedure for the Signal Conditioner Assembly. Functional operation is evaluated by checking Signal Conditioner Assembly input and output data for proper correlation. Procedural methods are incorporated to cause signal generation in normally nullified loops where possible in a G and N test configuration for maximum checkout capability.

Rev.	Let.	Date	TORR NO.	PAGES REVISED	APPROVAL	REFERENCES
A	8-24-67	34449	All	D.S.	MIT NASA	PS 6015000
B	8-31-67	34478	1, 2, 4-8, 10, 11, 13, 14	1-3, 12, 15-17	EA 1/2	JDC 12614 JDC 18100
C	10-10-67	34802	12	-	EA 2/2	IMPORTANT See below
D	1-12-68	35421	1, 2, 4-12, 15, 16	1-8, 10-16, 18	EA 1/2	INTERVAL
E	2-6-68	35561	7, 12, 13	3	EA 2/2	-
F	3-28-68	35977	1-3, 3-8, 10-13	4, 5, 12, 13	EA 1/2	TOOLS AND MATERIAL
G	7-25-68	36586	1, 9, 10, 12	-	EA 1/2	-
H	9-26-68	36861	1	-	EA 1/2	-
I	12-2-68	37073	All	All	EA 1/2	-

IMPORTANT: 1. Insure that connector assembly (2003089) is connected to the LGC test connector. 2. Step numbers preceded by an asterisk are not to be performed when testing with LEM.

A. PREPARATION  
NOTE: If SCA has been previously installed in system configuration prior to performance of this JDC, proceed with step A. 7; if installation is required, proceed with step A. 1.  
1. Perform, if applicable, JDC 12614 to downmode to OIA on mode.  
2. Remove DSKY Mounting Pedestal

VERIFICATION WITH SIDL REQUIRED BEFORE USE  
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FORM 01-3A  
Chg. 3, 18-16

and DSKY from Component Mounting Plate following detachment of ground strap and demating of cable W143 to DSKY.  
CAUTION: Extreme care must be exercised when mating connectors to prevent pin and socket damage.

3. Visually inspect J2 on Signal Conditioner Module (SCM) breakout box and 30J1 on SCA to insure that pins and sockets are not bent or damaged.

4. Carefully locate J2 on guide pins of 30J1; ease plug onto connector, maintaining parallelism between plug and connector as closely as possible; and engage Jackscrews until finger tight.

5. Turn each Jackscrew one turn at a time moving around connector in sequence until plug and connector are fully engaged.

6. Reinstall DSKY Mounting Pedestal with DSKY on Component Mounting Plate, attach ground strap and mate cable W143 to DSKY.

7. Perform JDC 12614 to place G and N system in ISS STANDBY mode with LGC operating.

NOTE: The 28 VDC G&N Power adjusted in step 8 will vary as result of heater cycling.

8. Set CROSSBAR CONTROL on Primary Signal Selector panel to 120 and adjust G&N

POWER ADJUST control on Test Control panel until DVM indicates 28 (±1.0) vdc. Record DVM indication.  
9. Insure that PROCEED Indicator of PROCEED/ISS OPERATE pushbutton on Test Control panel is lighted and Standby Requirements of JDC 12614 have been satisfied.

10. Press PROCEED/ISS OPERATE pushbutton. ISS OPERATE Indicator shall light.

B. PROCEDURE

1. Connect SCA GSE Distribution Box (GDB) stepper switch to DVM by setting CROSSBAR CONTROL switches on Primary Signal Selector panel to 271.

NOTE: To position Test Selector panel, perform following operations:

a. Press SIGNAL CONDITIONER LEVEL 1

ENABLE pushbutton if first digit on Test

Selector panel position is 1, or press SIGNAL

CONDITIONER LEVEL 2

ENABLE pushbutton if first digit is 2.

b. Press PUSH TO ADVANCE

pushbutton until display

indicates last two digits.

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2. Set Test Selector panel to 101 to measure and record 28 vdc LGC operate voltage (GG1523X) on DVM.  
3. Set Test Selector panel to 102 to measure and record 28 vdc IMU standby voltage (GG1513X) on DVM.  
PIPA S/G OUTPUT

4. Connect following signals to Oscillograph by setting switches on Oscillograph Signal Selector panel to positions indicated:

Switch  
CHANNEL 4 to 1 Z PIPA S/G output (GG2041V)

CHANNEL 5 to 1 Y PIPA S/G output (GG2021V)

CHANNEL 6 to 1 X PIPA S/G output (GG2001V)

CHANNEL 8 to 4 SCA GDB stepper switch

5. Insure that CH4AC, CH5AC, and CH6AC pushbuttons are lighted.

6. Set sensitivities on Oscillograph Amplifiers for channels 4, 5, and 6 to 500 MV/MM and set sensitivity on channel 8 to 5 V/MM. Use ZERO ADJ control to center all traces.

7. Perform the following DSKY operations:

a. VERB 36 ENTR

b. VERB 41 NOUN 20 ENTR

Observe:  
VERB 21 NOUN 22 Flashing

c. +00000 ENTR

Observe:  
VERB 22 NOUN 22 Flashing

d. -04500 ENTR

Observe:  
VERB 23 NOUN 22 Flashing

e. +03500 ENTR

8. Press CHART SPEEDS 1 pushbutton on Oscillograph Control panel.

NOTE: Perform steps 9 through 12 successively for each Test Selector panel position listed in Table I.

9. Set Test Selector panel to position listed in Table I.

10. Start Oscillograph by setting CHART DRIVE switch on Oscillograph Control panel to MM/SEC.

NOTE: Ignore all light indications in step 11.

11. Perform the following DSKY operation:  
VERB 35 ENTR

Table I

Test Selector Panel Position	Signal
117	Z PIPA G/S in-phase out.
118	Y PIPA G/S in-phase out.
119	X PIPA G/S in-phase out.

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12. Observe channel 8 for indication of PIPA loop opening for approximately 30 seconds then closing. Stop oscillograph. Record PIPA loop closure test results as satisfactory if loop closure indication on channel 8 corresponds to loop closure indication on channel 4, 5, or 6.

13. Perform the following DSKY operations:

a. VERB 41 NOUN 20 ENTR

Observe:  
VERB 21 NOUN 22 Flashing

b. +00000 ENTR

Observe:  
VERB 22 NOUN 22 Flashing

c. -22500 ENTR

Observe:  
VERB 23 NOUN 22 Flashing

d. -03500 ENTR

14. Repeat steps 9 through 12 then set all Oscillograph Amplifier sensitivities to OFF.

15. through 19. (Deleted)

20. Set CROSSBAR CONTROL on Primary Signal Selector panel to 173 and adjust G&N POWER ADJUST control on Test Control

panel until DVM indicates 28 (±0.25) vdc. Record DVM indication.

21. Set CROSSBAR CONTROL on Primary Signal Selector panel to 271.

22. Set Test Selector panel to positions listed below and measure and record DVM indication for each position:

NOTE: SCA TEST TMC INHIBIT Indicator on Temperature Monitor Control

panel will illuminate when Test Selector panel is set to positions 201 and 202. Following measurements in these positions, press SIGNAL CONDITIONER LEVEL 2 ENABLE pushbutton and verify that above inhibit indicator extinguishes.

Test Test Selector Panel Position

a. \*135 Cal Mod Temperature (GG2020T)

b. \*145 R&D vdc bias (GG1111V)

c. \*150 IMU Heater Current (GG2302X)

d. 201 PIPA Temperature (GG2300T)

e. \*202 IRIG Temperature (GG2301T)

f. 103 120 vdc ref. (GG1040V)

g. 104 2.5 vdc PCM bias (GG1110V)

h. 106 3200 cps 28 volt supply (GG1331V)

i. 113 800 cps 28 volt supply (GG1201V)

IG, MG, AND OG SERVO ERRORS

23. Perform following DSKY operations:

a. VERB 36 ENTR

b. VERB 41 NOUN 20 ENTR

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LEM SIGNAL CONDITIONER FUNCTIONAL CHECKOUT			JDC 12620 REV J PAGE 5 OF 19
JOB	SUBSYSTEM	LEM G & N SYSTEM	ASSY
JDC 12620 REV J PAGE 6 OF 19	c. Observe:		
	VERB 21	NOUN 22	Flashing
	d. +00000		ENTR
	e. Observe:		
	VERB 22	NOUN 22	Flashing
	f. +00000		ENTR
	g. Observe:		
	VERB 23	NOUN 22	Flashing
	h. +00000		ENTR
	i. VERB 21	NOUN 01	ENTR
	j. 00403		ENTR
	k. 00000		ENTR
	l. NOUN 15		ENTR
	m. 00000		ENTR
	n. 00000		ENTR
	o. 00000		ENTR
	p. 00000		ENTR
	q. 00000		ENTR
	24. Set switches on Signal Generator as follows:		
	a. RANGE to X.01		
	b. FREQUENCY meter to 6.0		
	c. FUNCTION to SQUARE		
	d. DC BALANCE to midposition		
	e. AMPLITUDE to 70.		
	25. Perform following DSKY operations:		
	a. VERB 42		ENTR
	b. VERB 33		ENTR
	26. Set FUNCTION switch on PAYM to 0° and FREQUENCY switch to 3200.		
	27. Press to light GIMBAL SERVO TEST pushbutton on Test Selector panel.		

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LEM SIGNAL CONDITIONER FUNCTIONAL CHECKOUT			JDC 12620 REV J PAGE 6 OF 19
JOB	SUBSYSTEM	LEM G & N SYSTEM	ASSY
JDC 12620 REV J PAGE 6 OF 19	35. Repeat step 29.		
	36. Set CROSSBAR CONTROL on Primary Signal Selector panel to 271 and set Test Selector panel to 138 to monitor MG servo error signal on DVM. (Output of SCA.)		
	37. Repeat steps 31 and 32.		
	38. Calculate MG servo error SCA output to MG servo error SCA input as follows. Record result.		
	MG servo error =		
	Step 37, max meter spread		
	Step 35, max meter spread = 0.91 (±15%)		
	39. Set GIMBAL SERVO TEST switch on Test Selector panel to 3 and set CROSSBAR CONTROL on Primary Signal Selector panel to 133 to monitor OG servo error signal on PAYM. (Input to SCA.)		
	40. Repeat step 29.		
	41. Set CROSSBAR CONTROL on Primary Signal Selector panel to 271 and set Test Selector panel to 139 to monitor OG servo error signal on DVM. (Output of SCA.)		
	42. Repeat steps 31 and 32.		
	43. Calculate OG servo error SCA output to OG servo error SCA input as follows: Record result.		
	OG servo error =		
	Step 42, max meter spread		
	Step 40, max meter spread = 0.91 (±15%)		
	44. Press to extinguish GIMBAL SERVO TEST pushbutton on Test Selector panel.		
	*IG, MG, AND OG TORQUE MOTOR CURRENTS (GG2110C, GG2140C, AND GG2170C)		
	*45. Insure that AMPLITUDE control on Signal Generator is set to 0.		
	*46. Connect jumper between PROBES OUTPUT DIRECT jacks and CH6DC IN jacks on Auxiliary Input panel.		
	*47. Set OSCILLOGRAPH SELECTOR CHANNEL 6 switch on Oscillograph Signal Selector panel to 15.		
	*48. Insure that CH6DC Indicator is lighted.		
	*49. Zero Oscillograph channel 6 and set sensitivity to 0.2 V/CM. Set sensitivity of channel 8 to 2 V/CM and zero adjust channel 8 for a centered trace with a 2.5 vdc bias input by off-setting zero line 12.5 mm to right of chart center line.		
	*50. Set FREQUENCY meter on Signal Generator to 5 and RANGE switch to X10.		
	*51. Set CHART DRIVE switch on Oscillograph Control panel to MM/SEC.		
	*52. Set CROSSBAR CONTROL on Primary Signal Selector panel to 176 to monitor Signal Generator output on Oscilloscope.		
	*53. Press to light GIMBAL SERVO TEST pushbutton on Test Selector panel.		
	*54. Connect PSA TPA direct probes to TE2-31 (high) and TB1-49 (low) to monitor IG torque motor current on channel 6. (Input to SCA.)		

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LEM SIGNAL CONDITIONER FUNCTIONAL CHECKOUT			JDC 12620 REV J PAGE 7 OF 19
JOB	SUBSYSTEM	LEM G & N SYSTEM	ASSY
JDC 12620 REV J PAGE 7 OF 19	*55. Set Test Selector panel to 132 and GIMBAL SERVO TEST switch to 1 to monitor IG torque motor current on channel 8. (Output of SCA.)		
	*56. Press to light TEST START pushbutton.		
	*57. Increase Signal Generator AMPLITUDE control until Oscilloscope indicates 2 volts peak-to-peak. Maintain Signal Generator AMPLITUDE control setting for approximately 10 seconds, then set AMPLITUDE control to 0.		
	*58. Press TEST STOP pushbutton on Test Selector panel. TEST START pushbutton shall go out.		
	*59. Set CHART DRIVE switch on Oscillograph Control panel to CM/HR. Measure and record peak-to-peak SCA input signal monitored on channel 6 and peak-to-peak SCA output signal monitored on channel 8.		
	*60. Set CHART DRIVE switch on Oscillograph Control panel to MM/SEC.		
	*61. Connect PSA TPA direct probes to TB2-32 (high) and TB1-49 (low) to monitor MG torque motor current on channel 6. (Input to SCA.)		
	*62. Press to light TEST START pushbutton.		
	*63. Increase Signal Generator AMPLITUDE control until Oscilloscope indicates 1 volt peak-to-peak. Maintain Signal Generator AMPLITUDE control setting for approximately 10 seconds, then set AMPLITUDE control to 0.		
	*64. Press TEST STOP pushbutton on Test Selector panel. TEST START pushbutton shall go out.		
	*65. Set CHART DRIVE switch on Oscillograph Control panel to CM/HR. Measure and record peak-to-peak SCA input signal monitored on channel 6 and peak-to-peak SCA output signal monitored on channel 8.		
	*66. Set CHART DRIVE switch on Oscillograph Control panel to MM/SEC.		
	*67. Connect PSA TPA direct probes to TB1-45 (high) and TB1-49 (low) to monitor OG torque motor current on channel 6. (Input to SCA.)		
	*68. Press to light TEST START pushbutton.		
	*69. Increase Signal Generator AMPLITUDE control until Oscilloscope indicates 1 volt peak-to-peak. Maintain Signal Generator AMPLITUDE control setting for approximately 10 seconds, then set AMPLITUDE control to 0.		
	*70. Press TEST STOP pushbutton on Test Selector panel. TEST START pushbutton shall go out.		
	*71. Set CHART DRIVE switch on Oscillograph Control panel to CM/HR. Measure and record peak-to-peak SCA input signal monitored on channel 6 and peak-to-peak SCA output signal monitored on channel 8.		
	*72. Press to light TEST START pushbutton.		
	*73. Increase Signal Generator AMPLITUDE control until Oscilloscope indicates 1 volt peak-to-peak. Maintain Signal Generator AMPLITUDE control setting for approximately 10 seconds, then set AMPLITUDE control to 0.		
	*74. Press TEST STOP pushbutton on Test Selector panel. TEST START pushbutton shall go out.		
	*75. Set CHART DRIVE switch on Oscillograph Control panel to CM/HR. Measure and record peak-to-peak SCA input signal monitored on channel 6 and peak-to-peak SCA output signal monitored on channel 8.		
	*76. Press to light TEST START pushbutton.		
	*77. Increase Signal Generator AMPLITUDE control until Oscilloscope indicates 1 volt peak-to-peak. Maintain Signal Generator AMPLITUDE control setting for approximately 10 seconds, then set AMPLITUDE control to 0.		

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LEM SIGNAL CONDITIONER FUNCTIONAL CHECKOUT			JDC 12620 REV J PAGE 8 OF 19
JOB	SUBSYSTEM	LEM G & N SYSTEM	ASSY
JDC 12620 REV J PAGE 8 OF 19	*IG, MG, AND OG CDU FINE PROBS (GG2220, GG2250, AND GG2280)		
	*72. Perform following DSKY operations:		
	a. VERB 41	NOUN 20	ENTR
	b. Observe:		
	VERB 21	NOUN 22	Flashing
	c. +00000		ENTR
	d. Observe:		
	VERB 22	NOUN 22	Flashing
	e. +00000		ENTR
	f. Observe:		
	VERB 23	NOUN 22	Flashing
	g. +00000		ENTR
	*73. Connect jumper between PROBES OUTPUT BUFFERED jacks and PAYM IN jacks on Auxiliary Input panel.		
	*74. Perform following DSKY operations:		
	a. VERB 21	NOUN 01	ENTR
	b. 00370		ENTR
	c. 16002		ENTR
	d. VERB 57		ENTR
	e. 00003		ENTR
	f. Observe:		
	VERB 06	NOUN 61	Flashing
	g. VERB 21		ENTR
	h. +00000		ENTR
	i. VERB 22		ENTR
	j. Site Latitude (from Table II)		ENTR
	k. VERB 33		ENTR
	l. 00004		ENTR
	m. 00001		ENTR
	*75. Within 10 to 90 seconds after performance of step 74, a, perform following DSKY operations:		
	a. VERB 21	NOUN 01	ENTR
	b. 02512		ENTR
	c. 00000		ENTR
	d. VERB 16	NOUN 20	ENTR
	*76. Record DSKY Row 1, Row 2, and Row 3 indications.		
	*77. Approximately 120 seconds after performance of step 76, record DSKY Row 1, Row 2, and Row 3 indications.		
	*78. Set Test Selector panel to 145 and CROSSBAR CONTROL on Primary Signal Selector panel to 271. Record R&D 2.5 vdc bias voltage indicated on DVM.		

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Test Site	Latitude
MIT	+42.366
AC	+42.902
GAEC	+40.748
MSC	+29.556
KSC	+28.524
NAA	+33.921

JOB	LEM SIGNAL CONDITIONER FUNCTIONAL CHECKOUT	JDC 12620 REV J PAGE 9 OF 19
SUBSYSTEM	LEM G & N SYSTEM	ASSY
*79. Connect PSA TPA buffered probes to TB3-37 (high) and TB3-34 (low) to monitor IG CDU fine error signal on PAVM. (Input to SCA.)		*86. Calculate SCA output MG CDU fine error to SCA input MG CDU fine error as follows. Record result: MG CDU fine error = $\frac{\text{Step 85 (Vdc)} - \text{Step 78}}{2.00 \times \text{Step 85 (vac)}} = 1 (\pm 20\%)$
*80. Set Test Selector panel to 140 to monitor IG CDU fine error signal on DVM. (Output of SCA.)		*87. Connect PSA TPA buffered probes to TB3-41 (high) and TB3-34 (low) to monitor OG CDU fine error signal on PAVM. (Input to SCA.)
NOTE: Due to earth rate, voltages measured in step 81 will vary.		*88. Set Test Selector panel to 142 to monitor OG CDU fine error signal on DVM. (Output of SCA.)
*81. Simultaneously measure and record SCA in-phase input voltage on PAVM and SCA output voltage on DVM.		NOTE: Due to earth rate, voltages measured in step 89 will vary.
*82. Calculate SCA output IG CDU fine error to SCA input IG CDU fine error as follows. Record result: IG CDU fine error = $\frac{\text{Step 81 (vdc)} - \text{Step 78}}{2.00 \times \text{Step 81 (vac)}} = 1 (\pm 20\%)$		*89. Simultaneously measure and record SCA in-phase input voltage on PAVM and SCA output voltage on DVM.
*83. Connect PSA TPA buffered probes to TB3-38 (high) and TB3-34 (low) to monitor MG CDU fine error signal on PAVM. (Input to SCA.)		*90. Calculate SCA output OG CDU fine error to SCA input OG CDU fine error as follows. Record result: OG CDU fine error = $\frac{\text{Step 89 (vdc)} - \text{Step 78}}{2.00 \times \text{Step 89 (vac)}} = 1 (\pm 20\%)$
*84. Set Test Selector panel to 141 to monitor MG CDU fine error signal on DVM. (Output of SCA.)		*91. Perform following DSKY operations: a. VERB 21 NOUN 01 ENTR b. 02512 ENTR c. 77776 ENTR
NOTE: Due to earth rate, voltages measured in step 85 will vary.		
*85. Simultaneously measure and record SCA in-phase input voltage on PAVM and SCA output voltage on DVM.		

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JOB	LEM SIGNAL CONDITIONER FUNCTIONAL CHECKOUT	JDC 12620 REV J PAGE 10 OF 19
SUBSYSTEM	LEM G & N SYSTEM	ASSY
*IG, MG, AND OG 1X RESOLVER SIN $\pm 10$ DEGREES (GG2121, GG2151, AND GG 2181)		and record IG 1X resolver sin voltage indicated on DVM. (Input to SCA.)
*92. Perform following DSKY operations: a. VERB 41 NOUN 20 ENTR b. Observe: VERB 21 NOUN 22 Flashing c. +01000 d. Observe: VERB 22 NOUN 22 Flashing e. +01000 f. Observe: VERB 23 NOUN 22 Flashing g. +01000		*98. Set CROSSBAR CONTROL on Primary Signal Selector panel to 271 and set Test Selector panel to 204. Measure and record IG 1X resolver sin voltage indicated on DVM. (Output of SCA.)
*93. Enter VERB 16 NOUN 20 into DSKY and press ENTR pushbutton. Verify that Row 1, Row 2, and Row 3 indicate approximately +01000.		*99. Calculate SCA output IG 1X resolver sin to SCA input IG 1X resolver sin as follows. Record result: IG 1X resolver sin $(45^\circ) =$ $\frac{2 (\text{Step 98} - \text{Step 22, g})}{2} = 1 (\pm 10\%)$
*94. Set Test Selector panel to 203 and measure and record OG 1X resolver sin voltage indicated on DVM. (Output of SCA.)		Step 97
*95. Set CROSSBAR CONTROL on Primary Signal Selector panel to 142 and measure and record OG 1X resolver sin voltage indicated on DVM. (Input to SCA.)		*100. Set Test Selector panel to 205 and measure and record MG 1X resolver sin voltage indicated on DVM. (Output of SCA.)
*96. Calculate SCA output OG 1X resolver sin to SCA input OG 1X resolver sin as follows. Record result: OG 1X resolver sin $(45^\circ) =$ $\frac{2 (\text{Step 94} - \text{Step 22, g})}{2} = 1 (\pm 10\%)$		*101. Set CROSSBAR CONTROL on Primary Signal Selector panel to 143 and measure and record MG 1X resolver sin voltage indicated on DVM. (Input to SCA.)
*97. Set CROSSBAR CONTROL on Primary Signal Selector panel to 144 and measure.		*102. Calculate SCA output MG 1X resolver sin to SCA input MG 1X resolver sin as follows. Record result: MG 1X resolver sin $(45^\circ) =$ $\frac{2 (\text{Step 100} - \text{Step 22, g})}{2} = 1 (\pm 10\%)$
		Step 101
		IG, MG, AND OG 1X RESOLVER SIN AND COS
		103. Perform following DSKY operations: a. VERB 41 NOUN 20 ENTR b. Observe: VERB 21 NOUN 22 Flashing

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JOB	LEM SIGNAL CONDITIONER FUNCTIONAL CHECKOUT	JDC 12620 REV J PAGE 11 OF 19
SUBSYSTEM	LEM G & N SYSTEM	ASSY
c. +04500 ENTR		110. Calculate SCA output MG 1X resolver cos to SCA input MG 1X resolver cos as follows. Record result: MG 1X resolver cos $(45^\circ) =$ $\frac{8.5 (\text{Step 108} - \text{Step 22, g})}{8.5} = 1 (\pm 10\%)$
d. Observe: VERB 22 NOUN 22 Flashing e. +04500 ENTR		Step 109
f. Observe: VERB 23 NOUN 22 Flashing g. +04500 ENTR		111. Set CROSSBAR CONTROL on Primary Signal Selector panel to 241 and measure and record OG 1X resolver cos voltage indicated on DVM. (Input to SCA.)
h. VERB 16 NOUN 20 ENTR		112. Set CROSSBAR CONTROL on Primary Signal Selector panel to 271 and set Test Selector panel to 122. Measure and record OG 1X resolver cos voltage indicated on DVM. (Output of SCA.)
104. Record DSKY Row 1, Row 2, and Row 3 indications.		113. Calculate SCA output OG 1X resolver cos to SCA input OG 1X resolver cos as follows. Record result: OG 1X resolver cos $(45^\circ) =$ $\frac{8.5 (\text{Step 112} - \text{Step 22, g})}{8.5} = 1 (\pm 10\%)$
105. Set CROSSBAR CONTROL on Primary Signal Selector panel to 243 and measure and record IG 1X resolver cos voltage indicated on DVM. (Input to SCA.)		Step 111
106. Set CROSSBAR CONTROL on Primary Signal Selector panel to 271 and set Test Selector panel to 120. Measure and record IG 1X resolver cos voltage indicated on DVM. (Output of SCA.)		114. Set Test Selector panel to 123 and measure and record IG 1X resolver sin voltage indicated on DVM. (Output of SCA.)
107. Calculate SCA output IG 1X resolver cos to SCA input IG 1X resolver cos as follows. Record result: IG 1X resolver cos $(45^\circ) =$ $\frac{8.5 (\text{Step 106} - \text{Step 22, g})}{8.5} = 1 (\pm 10\%)$		115. Set CROSSBAR CONTROL on Primary Signal Selector panel to 144 and measure and record IG 1X resolver sin voltage indicated on DVM. (Input to SCA.)
108. Set Test Selector panel to 121 and measure and record MG 1X resolver cos voltage indicated on DVM. (Output of SCA.)		116. Calculate SCA output IG 1X resolver sin to SCA input IG 1X resolver sin as follows. Record result: IG 1X resolver sin $(45^\circ) =$ $\frac{8.5 (\text{Step 114} - \text{Step 22, g})}{8.5} = 1 (\pm 10\%)$
		Step 115

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JOB	LEM SIGNAL CONDITIONER FUNCTIONAL CHECKOUT	JDC 12620 REV J PAGE 12 OF 19
SUBSYSTEM	LEM G & N SYSTEM	ASSY
117. Set CROSSBAR CONTROL on Primary Signal Selector panel to 143 and measure and record MG 1X resolver sin voltage indicated on DVM. (Input to SCA.)		c. +13500 ENTR d. Observe: VERB 22 NOUN 22 Flashing e. +13500 ENTR f. Observe: VERB 23 NOUN 22 Flashing g. +13500 ENTR h. Observe: GIMBAL LOCK Lighted
118. Set CROSSBAR CONTROL on Primary Signal Selector panel to 271 and set Test Selector panel to 124. Measure and record MG 1X resolver sin voltage indicated on DVM. (Output of SCA.)		1. VERB 16 NOUN 20 ENTR
119. Calculate SCA output MG 1X resolver sin to SCA input MG 1X resolver sin as follows. Record result: MG 1X resolver sin $(45^\circ) =$ $\frac{8.5 (\text{Step 118} - \text{Step 22, g})}{8.5} = 1 (\pm 10\%)$		124. Record DSKY Row 1, Row 2, and Row 3 indications.
120. Set Test Selector panel to 125 and measure and record OG 1X resolver sin voltage indicated on DVM. (Output of SCA.)		125. Repeat steps 105 and 106.
121. Set CROSSBAR CONTROL on Primary Signal Selector panel to 142 and measure and record OG 1X resolver sin voltage indicated on DVM. (Input to SCA.)		126. Calculate SCA output IG 1X resolver cos to SCA input IG 1X resolver cos as follows. Record result: IG 1X resolver cos $(135^\circ) =$ $\frac{8.5 (\text{Step 125 (106)} - \text{Step 22, g})}{8.5} = -1 (\pm 10\%)$
122. Calculate SCA output OG 1X resolver sin to SCA input OG 1X resolver sin as follows. Record result: OG 1X resolver sin $(45^\circ) =$ $\frac{8.5 (\text{Step 120} - \text{Step 22, g})}{8.5} = 1 (\pm 10\%)$		Step 125 (105)
123. Perform following DSKY operations: a. VERB 41 NOUN 20 ENTR b. Observe: VERB 21 NOUN 22 Flashing		127. Repeat steps 108 and 109.
		128. Calculate SCA output MG 1X resolver cos to SCA input MG 1X resolver cos as follows. Record result: MG 1X resolver cos $(135^\circ) =$ $\frac{8.5 (\text{Step 127 (108)} - \text{Step 22, g})}{8.5} = -1 (\pm 10\%)$
		Step 127 (109)
		129. Repeat steps 111 and 112.
		130. Calculate SCA output OG 1X resolver cos to SCA input OG 1X resolver cos as follows. Record result: OG 1X resolver cos $(135^\circ) =$ $\frac{8.5 (\text{Step 129 (112)} - \text{Step 22, g})}{8.5} = -1 (\pm 10\%)$
		Step 129 (111)

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JOB	LEM SIGNAL CONDITIONER FUNCTIONAL CHECKOUT	JDC 12620 REV J PAGE 13 OF 17
SUBSYSTEM	LEM G & N SYSTEM	ASSY
131.	Repeat steps 114 and 115.	138. Record DSKY Row 1, Row 2, and Row 3 indications.
132.	Calculate SCA output IG 1X resolver sin to SCA input IG 1X resolver sin as follows. Record result: IG 1X resolver sin $(135^\circ) =$ <u><math>8.5 \text{ [Step 131 (114) - Step 22.g]} = 1 (\pm 10\%)</math></u> Step 131 (115)	139. Repeat steps 105 and 106.
133.	Repeat steps 117 and 118.	140. Calculate SCA output IG 1X resolver cos to SCA input IG 1X resolver cos as follows. Record result: IG 1X resolver cos $(225^\circ) =$ <u><math>8.5 \text{ [Step 139 (106) - Step 22.g]} = -1 (\pm 10\%)</math></u> Step 139 (106)
134.	Calculate SCA output MG 1X resolver sin to SCA input MG 1X resolver sin as follows. Record result: MG 1X resolver sin $(135^\circ) =$ <u><math>8.5 \text{ [Step 133 (118) - Step 22.g]} = 1 (\pm 10\%)</math></u> Step 133 (117)	141. Repeat steps 108 and 109.
135.	Repeat steps 120 and 121.	142. Calculate SCA output MG 1X resolver cos to SCA input MG 1X resolver cos as follows. Record result: MG 1X resolver cos $(225^\circ) =$ <u><math>8.5 \text{ [Step 141 (108) - Step 22.g]} = -1 (\pm 10\%)</math></u> Step 141 (108)
136.	Calculate SCA output OG 1X resolver sin to SCA input OG 1X resolver sin as follows. Record result: OG 1X resolver sin $(135^\circ) =$ <u><math>8.5 \text{ [Step 135 (120) - Step 22.g]} = 1 (\pm 10\%)</math></u> Step 135 (121)	143. Repeat steps 111 and 112.
137.	Perform following DSKY operations: a. VERB 41 NOUN 20 ENTR b. Observe: VERB 21 NOUN 22 Flashing c. +22500 d. Observe: VERB 22 NOUN 22 Flashing e. +22500 f. Observe: VERB 23 NOUN 22 Flashing g. +22500 h. VERB 16 NOUN 20 ENTR	144. Calculate SCA output OG 1X resolver cos to SCA input OG 1X resolver cos as follows. Record result: OG 1X resolver cos $(225^\circ) =$ <u><math>8.5 \text{ [Step 143 (112) - Step 22.g]} = -1 (\pm 10\%)</math></u> Step 143 (111)
		145. Repeat steps 114 and 115.
		146. Calculate SCA output IG 1X resolver sin to SCA input IG 1X resolver sin as follows. Record result: IG 1X resolver sin $(225^\circ) =$ <u><math>8.5 \text{ [Step 145 (114) - Step 22.g]} = -1 (\pm 10\%)</math></u> Step 145 (115)
		147. Repeat steps 117 and 118.

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JOB	LEM SIGNAL CONDITIONER FUNCTIONAL CHECKOUT	JDC 12620 REV J PAGE 14 OF 19
SUBSYSTEM	LEM G & N SYSTEM	ASSY
148. Calculate SCA output MG 1X resolver sin to SCA input MG 1X resolver sin as follows. Record result: MG 1X resolver sin $(225^\circ) =$ $8.5 \text{ [Step 147 (118) - Step 22.g]} = -1 (\pm 10\%)$ Step 147 (117)		155. Repeat steps 108 and 109.
149. Repeat steps 120 and 121.		156. Calculate SCA output MG 1X resolver cos to SCA input MG 1X resolver cos as follows. Record result: MG 1X resolver cos $(315^\circ) =$ $8.5 \text{ [Step 155 (108) - Step 22.g]} = 1 (\pm 10\%)$ Step 155 (109)
150. Calculate SCA output OG 1X resolver sin to SCA input OG 1X resolver sin as follows. Record result: OG 1X resolver sin $(225^\circ) =$ $8.5 \text{ [Step 149 (120) - Step 22.g]} = -1 (\pm 10\%)$ Step 149 (121)		157. Repeat steps 111 and 112.
151. Perform following DSKY operations: a. VERB 41 NOUN 20 ENTR b. Observe: VERB 21 NOUN 22 Flashing c. +31500 d. Observe: VERB 22 NOUN 22 Flashing e. +31500 f. Observe: VERB 23 NOUN 22 Flashing g. +31500 h. VERB 16 NOUN 20 ENTR 152. Record DSKY Row 1, Row 2, and Row 3 indications.		158. Calculate SCA output OG 1X resolver cos to SCA input OG 1X resolver cos as follows. Record result: OG 1X resolver cos $(315^\circ) =$ $8.5 \text{ [Step 157 (112) - Step 22.g]} = 1 (\pm 10\%)$ Step 157 (111)
153. Repeat steps 106 and 106.		159. Repeat steps 114 and 115.
154. Calculate SCA output IG 1X resolver cos to SCA input IG 1X resolver cos as follows. Record result: IG 1X resolver cos $(315^\circ) =$ $8.5 \text{ [Step 153 (106) - Step 22.g]} = 1 (\pm 10\%)$ Step 153 (106)		160. Calculate SCA output IG 1X resolver sin to SCA input IG 1X resolver sin as follows. Record result: IG 1X resolver sin $(315^\circ) =$ $8.5 \text{ [Step 159 (114) - Step 22.g]} = -1 (\pm 10\%)$ Step 159 (115)
		161. Repeat steps 117 and 118.
		162. Calculate SCA output MG 1X resolver sin to SCA input MG 1X resolver sin as follows. Record result: MG 1X resolver sin $(315^\circ) =$ $8.5 \text{ [Step 161 (118) - Step 22.g]} = -1 (\pm 10\%)$ Step 161 (117)
		163. Repeat steps 120 and 121.
		164. Calculate SCA output OG 1X resolver sin to SCA input OG 1X resolver sin as follows. Record result: OG 1X resolver sin $(315^\circ) =$ $8.5 \text{ [Step 163 (120) - Step 22.g]} = -1 (\pm 10\%)$ Step 163 (121)

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JOB	LEM SIGNAL CONDITIONER FUNCTIONAL CHECKOUT	JDC 12620 REV J PAGE 15 OF 19
SUBSYSTEM	LEM G & N SYSTEM	ASSY
165. Perform following DSKY operations: a. VERB 41 NOUN 20 ENTR b. Observe: VERB 21 NOUN 22 Flashing c. +00000 d. Observe: VERB 22 NOUN 22 Flashing e. +00000 f. Observe: VERB 23 NOUN 22 Flashing g. +00000 RR SHAFT AND TRUNNION FINE ERROR		*173. Adjust RESOLVER ANGLE TRANSMITTER control to produce a minimum total voltage on PAVM. Record DVM indication.
166. Prepare Resolver Circuit Tester (RCT) as follows: a. Set Decade Error Bridge (DEB) panel switches and controls to OFF, minimum, or zero. b. Connect cable W172 to GSF distribution box (GDB). c. Connect RCT power cable to facility 115 vac power. d. Connect jumper from DEB panel OUTPUT jacks to SIGNAL INPUT jacks. e. Set 800~REFERENCE INPUT VOLTAGE switch to 26V. POWER indicator shall light. f. Press POWER ON pushbutton on RCT Control panel. POWER ON, READ MODE, and MON COARSE or MON FINE indicators shall light. g. Insure that one of the three operating channel indicators (IG, MG, or OG		*174. Adjust RESOLVER ANGLE TRANSMITTER control until in-phase voltage on PAVM is +720 mv. Record DVM indication. *175. Press TRUN SELECT/SET ENABLE pushbutton. Both halves of pushbutton shall light. *176. Connect trunnion CDU fine error output from SCA to DVM by setting Test Selector panel to 147. *177. Remove PSA TPA buffered probe from TB3-33 (high) and connect to TB3-30 (high). *178. Adjust RESOLVER ANGLE TRANSMITTER control until in-phase voltage on PAVM is +720 mv. Record DVM indication. *179. Adjust RESOLVER ANGLE TRANSMITTER control until PAVM indicates minimum total voltage. Record DVM indication. *180. Perform following DSKY operations: a. VERB 21 NOUN 10 ENTR b. 00012 ENTR c. 00010 ENTR RR SHAFT AND TRUNNION 1X RESOLVER SIN AND COS NOTE: G/N CAUTION lamp on Monitor panel and PROG lamp on DSKY will light during performance of steps 181 through 194.

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JOB	LEM SIGNAL CONDITIONER FUNCTIONAL CHECKOUT	JDC 12620 REV J PAGE 16 OF 19
SUBSYSTEM	LEM G & N SYSTEM	ASSY
r. Set REFERENCE QUADRANT switch to $0^\circ-90^\circ$ . *167. Set RESOLVER ANGLE TRANSMITTER control to 0. *168. Press READ MODE/SET MODE pushbutton to light SET MODE indicator. *169. Press SHAFT SELECT/SET ENABLE pushbutton. Both halves of pushbutton shall light. *170. Connect shaft CDU fine error output from SCA to DVM by setting Test Selector panel to 146. Insure that CROSSBAR CONTROL on Primary Signal Selector panel is set to 271. NOTE: G/N CAUTION lamp on Monitor panel and PROG lamp on DSKY will light during performance of steps 171 through 179. Ignore lamp indications. *171. Perform following DSKY operations: a. VERB 40 NOUN 40 ENTR b. VERB 21 NOUN 10 ENTR c. 00012 ENTR d. 00011 ENTR *172. Monitor SCA input on PAVM by connecting PSA TPA buffered probe to TB3-33 (high) and TB3-34 (low) and connecting jumper between PROBES OUTPUT BUFFERED jacks and PAVM IN jacks on Auxiliary Input panel. Set VOLT/METER INPUT PAVM switch on Primary Signal Selector panel to AUX.		*173. Adjust RESOLVER ANGLE TRANSMITTER control to produce a minimum total voltage on PAVM. Record DVM indication. *174. Adjust RESOLVER ANGLE TRANSMITTER control until in-phase voltage on PAVM is +720 mv. Record DVM indication. *175. Press TRUN SELECT/SET ENABLE pushbutton. Both halves of pushbutton shall light. *176. Connect trunnion CDU fine error output from SCA to DVM by setting Test Selector panel to 147. *177. Remove PSA TPA buffered probe from TB3-33 (high) and connect to TB3-30 (high). *178. Adjust RESOLVER ANGLE TRANSMITTER control until in-phase voltage on PAVM is +720 mv. Record DVM indication. *179. Adjust RESOLVER ANGLE TRANSMITTER control until PAVM indicates minimum total voltage. Record DVM indication. *180. Perform following DSKY operations: a. VERB 21 NOUN 10 ENTR b. 00012 ENTR c. 00010 ENTR RR SHAFT AND TRUNNION 1X RESOLVER SIN AND COS NOTE: G/N CAUTION lamp on Monitor panel and PROG lamp on DSKY will light during performance of steps 181 through 194.

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LEM SIGNAL CONDITIONER  
FUNCTIONAL CHECKOUT

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SUBSYSTEM	LEM G & N SYSTEM	ASSY
181.	Perform following DSKY operations:	183. Press TRUN SELECT/SET ENABLE pushbutton on RCT Control panel. Both halves of pushbutton shall light.
a. VERB 36	ENTR	
b. VERB 40	NOUN 40	ENTR
182. Set following switches on DEB and RCT Control panels:		184. Enter VERB 06 NOUN 40 into DSK Y and press ENTR pushbutton. Verify that DSKY Row 1 indicates approximately 045/0 and Row 2 indicates approximately 00000.
a. DEB - REFERENCE QUADRANT to 0°-90°.		185. Insure that CROSSBAR CONTROL on Primary Signal Selector panel is set to 271.
b. DEB - SENSITIVITY fully CCW.		186. Set Test Selector panel to 128. Measure and record trunnion 1X resolver sin voltage output from SCA on DVM.
c. RCT - Insure that one of the three operating channel indicators (IG, MG, or OG SELECT) is lighted. Insure that READ RATE TABLE INPUT and LORS RATE TABLE CONTROL Indicators are not lighted.		187. Set Test Selector panel to 131. Measure and record trunnion 1X resolver cos voltage output from SCA on DVM.
d. RCT - SET MODE lighted.		188. Press SHAFT SELECT/SET ENABLE pushbutton on RCT Control panel. Both halves of pushbutton shall light.
e. DEB - DEGREES to 0°-45. 000.		189. Enter VERB 06 NOUN 40 into DSKY and press ENTR pushbutton. Verify that DSKY Row 1 indicates approximately 00000 and Row 2 indicates approximately 04500.
f. RCT - MON COARSE lighted.		190. Set Test Selector panel to 129. Measure and record shaft 1X resolver sin voltage output from SCA on DVM.
g. RCT - RESOLVER ANGLE TRANSMITTER to 45. 000.		191. Set Test Selector panel to 130. Measure and record shaft 1X resolver cos voltage output from SCA on DVM.
h. DEB/RCT - Rotate RESOLVER ANGLE TRANSMITTER control and SENSITIVITY COARSE control to null meter.		192. Set RESOLVER ANGLE TRANSMITTER control to 0.
i. DEB - SENSITIVITY fully CCW.		193. Set 800~ REFERENCE INPUT VOLT-AGE switch on DEB to OFF.
j. RCT - MON FINE lighted.		
k. DEB - DEGREES to 0°-00. 000.		
1. DEB/RCT - Rotate RESOLVER ANGLE TRANSMITTER control and SENSITIVITY COARSE and FINE controls to null meter.		
m. DEB - SENSITIVITY fully CCW.		
n. RCT - Insure that IG, MG, and OG SELECT are not lighted.		

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LEM SIGNAL CONDITIONER  
FUNCTIONAL CHECKOUT

JOB JDC 12620 REV J PAGE 18 OF 19

SUBSYSTEM	LEM G & N SYSTEM	ASSY
194.	Perform following DSKY operations:	196. Connect jumper between PROBES OUTPUT DIRECT jacks and PAVM IN jacks on Auxiliary Input panel. Set VOLTMETER INPUT PAVM switch on Primary Signal Selector panel to AUX.
a. VERB 36	ENTR	
b. VERB 41	NOUN 20	ENTR
c. Observe:		197. Connect PSA TPA direct probes to TB4-43 (high) and TB4-47 (low) and measure and record yaw attitude error total voltage indicated on PAVM. (Input to SCA.)
d. +00000	NOUN 22	Flashing
e. Observe:		198. Set Test Selector panel to 114 and measure and record yaw attitude error voltage indicated on DVM. (Output of SCA.)
f. +00000	NOUN 22	Flashing
g. Observe:		199. Calculate SCA output yaw attitude error to SCA input yaw attitude error as follows. Record result:
h. +00000	NOUN 22	Flashing
NOTE: ISS WARNING lamp on Monitor panel may light during performance of step 195. Ignore lamp indication.		
195. Perform following DSKY operations:		200. Connect PSA TPA direct probes to TB4-45 (high) and TB4-49 (low) and measure and record pitch attitude error total voltage indicated on PAVM. (Input to SCA.)
a. VERB 21	NOUN 10	ENTR
b. 00012	ENTR	
c. 00060	ENTR	
d. VERB 43	ENTR	
e. Observe:		201. Set Test Selector panel to 115 and measure and record pitch attitude error voltage indicated on DVM. (Output of SCA.)
f. +01600	NOUN 22	Flashing
g. Observe:		202. Calculate SCA output pitch attitude error to SCA input pitch attitude error as follows. Record result:
h. +01600	NOUN 22	Flashing
i. Observe:		Pitch attitude error =
j. +01600	NOUN 22	Flashing
		2.44 (Step 201 - Step 22.g) = 1 (±10%)

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LEM SIGNAL CONDITIONER  
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SUBSYSTEM	LEM G & N SYSTEM	ASSY
203.	Connect PSA TPA direct probes to TB4-44 (high) and TB4-48 (low) and measure and record roll attitude error total voltage indicated on PAVM. (Input to SCA.)	
204. Set Test Selector panel to 116 and measure and record roll attitude error voltage indicated on DVM. (Output of SCA.)		
205. Calculate SCA output roll attitude error to SCA input roll attitude error as follows. Record result:		
Roll attitude error =		
2.44 (Step 204 - Step 22.g) = 1 (±10%)		
Step 203		
206. Perform following DSKY operations:		
a. VERB 36	ENTR	
b. VERB 41	NOUN 20	ENTR
c. Observe:		
VERB 21	NOUN 22	Flashing
d. +00000	ENTR	
e. Observe:		
VERB 22	NOUN 22	Flashing
f. +00000	ENTR	
g. Observe:		
VERB 23	NOUN 22	Flashing
h. +00000	ENTR	
207. Press POWER ON pushbutton on RCT Control panel. The pushbutton shall extinguish.		
208. Disconnect cable W172 from GDB.		

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## JOB LEM SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

NO. 12620DC REV J 32757 INITIAL TDRR							
TEST HISTORY							
DATE START END SITE/LOCATION							
TIME START END TOTAL ELAPSED							
MAJOR GROUND SUPPORT EQUIPMENT							
NAME SER. NO. CAL DATE							
NAME SER. NO. CAL DATE							
CONDUCTED BY NAME/AFFILIATION APPROVED BY NAME/AFFILIATION							
JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
A. 8	Bus voltage	vdc	27.00		29.00		
B. 2	28 vdc LGC operate	vdc	3.9		4.8		
B. 3	28 vdc IMU standby	vdc	3.9		4.8		
B. 13	Loop closure (Channel 8 to 4)						
B. 15	Loop closure (Channel 8 to 5)						
B. 19	Loop closure (Channel 8 to 6)						
B. 20	Bus voltage	vdc	27.75		28.25		
B. 22. a	*Cal Mod Temp	vdc	0.40		1.26		
B. 22. b	*R&D 2.5 vdc bias	vdc	2.47		2.53		

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JOB LEM SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ ACC
B. 22. c	*IMU heater current	vdc	3.9		4.8	
B. 22. d	PIPA Temp	vdc	2.0		3.0	
B. 22. c	*IRIG Temp	vdc	2.37		3.70	
B. 22. f	120 vdc reference	vdc	2.80		4.20	
B. 22. g	2.5 vdc PCM bias	vdc	2.47		2.53	
B. 22. h	3200 cps, 28v supply	vdc	4.20		4.80	
B. 22. i	800 cps, 28v supply	vdc	4.20		4.80	
B. 29	Maximum right Maximum left	vac				
	Maximum meter spread (IG servo error, SCA input)	vac				
B. 31	Maximum high Maximum low	vdc				
	Maximum meter spread (IG servo error, SCA output)	vdc				
B. 33	IG servo error		0.7735		1.0465	
B. 35 (B. 29)	Maximum right Maximum left	vac				
	Maximum meter spread (MG servo error, SCA input)	vac				

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EQUIPMENT TEST  
DATA SHEET 3 OF 19

JDC  
NO. 12620  
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JOB LEM SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ ACC
B. 37 (B. 31)	Maximum high Maximum low Maximum meter spread (MG servo error, SCA output)	vdc				
B. 38	MG servo error		0.7735		1.0465	
B. 40 (B. 29)	Maximum left Maximum meter spread (OG servo error, SCA input)	vac				
B. 42 (B. 31)	Maximum high Maximum low Maximum meter spread (OG servo error, SCA output)	vdc				
B. 43	OG servo error		0.7735		1.0465	
B. 59	*IG TMC (Channel 6)	v p-p				
	*IG TMC (Channel 8)	v p-p	Channel 6 x 5.0 -15%		Channel 6 x 5.0 +15%	
B. 65	*MG TMC (Channel 6)	v p-p				
	*MG TMC (Channel 8)	v p-p	Channel 6 x 5.0 -15%		Channel 6 x 5.0 +15%	

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EQUIPMENT TEST  
DATA SHEET 4 OF 19

JDC  
NO. 12620  
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JOB LEM SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ ACC
B. 71	*OG TMC (Channel 6)	v p-p				
	*OG TMC (Channel 8)	v p-p	Channel 6 x 2.75 -15%		Channel 6 x 2.75 +15%	
B. 76	*Row 1	deg				
	*Row 2	deg				
	*Row 3	deg				
B. 77	*Row 1	deg				
	*Row 2	deg				
	*Row 3	deg				
B. 78	*R&D 2.5 vdc bias	vdc				
B. 81	*IG CDU fine error (PAVM)	vac				
	*IG CDU fine error (DVM)	vdc				
B. 82	*IG CDU fine error		0.80		1.20	
B. 85	*MG CDU fine error (PAVM)	vac				
	*MG CDU fine error (DVM)	vdc				
B. 86	*MG CDU fine error		0.80		1.20	
B. 89	*OG CDU fine error (PAVM)	vac				
	*OG CDU fine error (DVM)	vdc				

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JDC  
NO. 12620  
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JOB LEM SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ ACC
B. 90	*OG CDU fine error		0.80		1.20	
B. 94	*OG IX resolver	vdc				
B. 95	*OG IX resolver	vac				
B. 96	*OG IX resolver		0.90		1.10	
B. 97	*IG IX resolver	vac				
B. 98	*IG IX resolver	vdc				
B. 99	*IG IX resolver		0.90		1.10	
B. 100	*MG IX resolver	vdc				
B. 101	*MG IX resolver	vac				
B. 102	*MG IX resolver		0.90		1.10	
B. 104	Row 1	deg				
	Row 2	deg				
	Row 3	deg				
B. 105	IG IX resolver cos	vac				
B. 106	IG IX resolver cos	vdc				
B. 107	IG IX resolver cos (45°)		0.90		1.10	
B. 108	MG IX resolver cos	vdc				
B. 109	MG IX resolver cos	vac				
B. 110	MG IX resolver cos (45°)		0.90		1.10	
B. 111	OG IX resolver cos	vac				

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JDC  
NO. 12620  
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JOB LEM SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ ACC
B. 112	OG IX resolver cos	vdc				
B. 113	OG IX resolver cos (45°)		0.90		1.10	
B. 114	IG IX resolver sin	vdc				
B. 115	IG IX resolver sin	vac				
B. 116	IG IX resolver sin (45°)		0.90		1.10	
B. 117	MG IX resolver sin	vac				
B. 118	MG IX resolver sin	vdc				
B. 119	MG IX resolver sin (45°)		0.90		1.10	
B. 120	OG IX resolver sin	vdc				
B. 121	OG IX resolver sin	vac				
B. 122	OG IX resolver sin (45°)		0.90		1.10	
B. 124	Row 1	deg				
	Row 2	deg				
	Row 3	deg				
B. 125	IG IX resolver cos	vac				
B. 125 (B. 105)						
B. 125	IG IX resolver cos	vdc				
B. 126	IG IX resolver cos (135°)		-0.90		-1.10	
B. 127	MG IX resolver cos	vdc				
B. 127 (B. 106)						

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JDC  
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JOB LEM SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ ACC
B. 127	MG IX resolver cos	vac				
B. 128	MG IX resolver cos (135°)		-0.90		-1.10	
B. 129	OG IX resolver	vac				
B. 129 (B. 111)						
B. 129	OG IX resolver	vdc				
B. 129 (B. 112)						
B. 130	OG IX resolver cos (135°)		-0.90		-1.10	
B. 131	IG IX resolver sin	vdc				
B. 131 (B. 114)						
B. 131	IG IX resolver sin	vac				
B. 131 (B. 115)						
B. 132	IG IX resolver sin (135°)		0.90		1.10	
B. 133	MG IX resolver	vac				
B. 133 (B. 117)						
B. 133	MG IX resolver	vdc				
B. 133 (B. 118)						
B. 134	MG IX resolver sin (135°)		0.90		1.10	
B. 135	OG IX resolver	vdc				
B. 135 (B. 120)						
B. 135	OG IX resolver	vac				
B. 135 (B. 121)						
B. 136	OG IX resolver sin (135°)		0.90		1.10	

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EQUIPMENT TEST  
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JDC  
NO. 12620  
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JOB LEM SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ ACC
B. 136	Row 1	deg				
	Row 2	deg				
	Row 3	deg				
B. 139	IG IX resolver cos	vac				
B. 139 (B. 105)						
B. 139	IG IX resolver	vdc				
B. 140	IG IX resolver cos (225°)		-0.90		-1.10	
B. 141	MG IX resolver	vdc				
B. 141 (B. 108)						
B. 141	MG IX resolver	vac				
B. 141 (B. 109)						
B. 142	MG IX resolver cos (225°)		-0.90		-1.10	
B. 143	OG IX resolver	vac				
B. 143 (B. 111)						
B. 143	OG IX resolver	vdc				
B. 143 (B. 112)						
B. 144	OG IX resolver cos (225°)		-0.90		-1.10	
B. 145	IG IX resolver sin	vdc				
B. 145 (B. 114)						
B. 145	IG IX resolver sin	vac				
B. 145 (B. 115)						
B. 146	IG IX resolver sin (225°)		-0.90		-1.10	

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JOB LEM SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ ACC
B. 147	MG IX resolver sin	vac				
B. 147 (B. 117)						
B. 147	MG IX resolver	vdc				
B. 147 (B. 118)						
B. 148	MG IX resolver sin (225°)		-0.90		-1.10	
B. 149	OG IX resolver sin	vdc				
B. 149 (B. 120)						
B. 149	OG IX resolver sin	vac				
B. 149 (B. 121)						
B. 150	OG IX resolver sin (225°)		-0.90		-1.10	
B. 152	Row 1	deg				
	Row 2	deg				
	Row 3	deg				
B. 153	IG IX resolver cos	vac				
B. 153 (B. 105)						
B. 153	IG IX resolver cos	vdc				
B. 153 (B. 106)						
B. 154	IG IX resolver cos (315°)		0.90		1.10	
B. 155	MG IX resolver cos	vdc				
B. 155 (B. 108)						
B. 155	MG IX resolver cos	vac				
B. 155 (B. 109)						
B. 156	MG IX resolver cos (315°)		0.90		1.10	

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JDC  
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JOB LEM SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ ACC
B. 157 (B. 111)	OG 1X resolver cos	vac				
B. 157 (B. 112)	OG 1X resolver cos	vdc				
B. 158	OG 1X resolver cos (315°)		0.90		1.10	
B. 159 (B. 114)	IG 1X resolver sin	vdc				
B. 159 (B. 115)	IG 1X resolver sin	vac				
B. 160	IG 1X resolver sin (315°)		-0.90		-1.10	
B. 161 (B. 117)	MG 1X resolver sin	vac				
B. 161 (B. 118)	MG 1X resolver sin	vdc				
B. 162	MG 1X resolver sin (315°)		-0.90		-1.10	
B. 163 (B. 120)	OG 1X resolver sin	vdc				
B. 163 (B. 121)	OG 1X resolver sin	vac				
B. 164	OG 1X resolver sin (315°)		-0.90		-1.10	
B. 173	*Shaft CDU fine error	vdc	2.45		2.55	

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EQUIPMENT TEST  
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JDC  
NO. 12620  
REV. J

JOB LEM SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ ACC
B. 174	*Shaft CDU fine error	vdc	3.75		4.25	
B. 178	*Trunnion CDU fine error	vdc	3.75		4.25	
B. 179	*Trunnion CDU fine error	vdc	2.45		2.55	
B. 186	Trunnion 1X resolver sin	vdc	4.45		4.95	
B. 187	Trunnion 1X resolver cos	vdc	4.45		4.95	
B. 190	Shaft 1X resolver sin	vdc	4.45		4.95	
B. 191	Shaft 1X resolver cos	vdc	4.45		4.95	
B. 197	Yaw attitude error	vac				
B. 198	Yaw attitude error	vdc				
B. 199	Yaw attitude error		0.90		1.10	
B. 200	Pitch attitude error	vac				
B. 201	Pitch attitude error	vdc				
B. 202	Pitch attitude error		0.90		1.10	
B. 203	Roll attitude error	vac				
B. 204	Roll attitude error	vdc				
B. 205	Roll attitude error		0.90		1.10	

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EQUIPMENT TEST  
DATA SHEET 12 OF 19

JDC  
NO. 12620  
REV. J

JOB LEM SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

JDC ITEM NO.	CALCULATIONS
B. 33	IG Servo Error = $\frac{\text{SCA output (Step 31, Maximum Meter Spread)}}{\text{SCA input (Step 29, Maximum Meter Spread)}} = 0.91 (\pm 15\%)$
B. 38	MG Servo Error = $\frac{\text{SCA output (Step 37, Maximum Meter Spread)}}{\text{SCA input (Step 35, Maximum Meter Spread)}} = 0.91 (\pm 15\%)$
B. 43	OG Servo Error = $\frac{\text{SCA output (Step 42, Maximum Meter Spread)}}{\text{SCA input (Step 40, Maximum Meter Spread)}} = 0.91 (\pm 15\%)$
B. 82	*IG CDU Fine Error = $\frac{\text{SCA output (Step 81, vdc) - 2.5V R\&D Bias (Step 78)}}{2.00 \times \text{SCA input (Step 81, vac)}} = 1 (\pm 20\%)$
B. 86	*MG CDU Fine Error = $\frac{\text{SCA output (Step 85, vdc) - 2.5V R\&D Bias (Step 78)}}{2.00 \times \text{SCA input (Step 85, vac)}} = 1 (\pm 20\%)$

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FORM 01-8  
Chg. 7-23-65

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JDC  
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JOB LEM SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

JDC ITEM NO.	CALCULATIONS
B. 90	*OG CDU Fine Error = $\frac{\text{SCA output (Step 89, vdc) - 2.5V R\&D Bias (Step 78)}}{2.00 \times \text{SCA input (Step 89, vac)}} = 1 (\pm 20\%)$
B. 96	*OG 1X Resolver Sin ( $\pm 10^\circ$ ) = $\frac{2 \times [\text{SCA output (Step 94) - 2.5V PCM Bias (Step 22, g)}]}{\text{SCA input (Step 95)}} = 1 (\pm 10\%)$
B. 99	*IG 1X Resolver Sin ( $\pm 10^\circ$ ) = $\frac{2 \times [\text{SCA output (Step 98) - 2.5V PCM Bias (Step 22, g)}]}{\text{SCA input (Step 97)}} = 1 (\pm 10\%)$
B. 102	*MG 1X Resolver Sin ( $\pm 10^\circ$ ) = $\frac{2 \times [\text{SCA output (Step 100) - 2.5V PCM Bias (Step 22, g)}]}{\text{SCA input (Step 101)}} = 1 (\pm 10\%)$
B. 107	IG 1X Resolver Cos ( $45^\circ$ ) = $\frac{8.5 \times [\text{SCA output (Step 106) - 2.5V PCM Bias (Step 22, g)}]}{\text{SCA input (Step 105)}} = 1 (\pm 10\%)$

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FORM 01-8  
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APOLLO G&N  
EQUIPMENT TEST  
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JDC  
NO. 12620  
REV. J

JOB LEM SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

JDC ITEM NO.	CALCULATIONS
B. 110	$\text{MG 1X Resolver Cos } (45^\circ) =$ $8.5 \times \frac{[\text{SCA Output (Step 108)} - 2.5\text{V PCM Bias (Step 22.g)}]}{\text{SCA Input (Step 109)}} = 1 (\pm 10\%)$
B. 113	$\text{OG 1X Resolver Cos } (45^\circ) =$ $8.5 \times \frac{[\text{SCA Output (Step 112)} - 2.5\text{V PCM Bias (Step 22.g)}]}{\text{SCA Input (Step 111)}} = 1 (\pm 10\%)$
B. 116	$\text{IG 1X Resolver Sin } (45^\circ) =$ $8.5 \times \frac{[\text{SCA Output (Step 114)} - 2.5\text{V PCM Bias (Step 22.g)}]}{\text{SCA Input (Step 115)}} = 1 (\pm 10\%)$
B. 119	$\text{MG 1X Resolver Sin } (45^\circ) =$ $8.5 \times \frac{[\text{SCA Output (Step 118)} - 2.5\text{V PCM Bias (Step 22.g)}]}{\text{SCA Input (Step 117)}} = 1 (\pm 10\%)$
B. 122	$\text{OG 1X Resolver Sin } (45^\circ) =$ $8.5 \times \frac{[\text{SCA Output (Step 120)} - 2.5\text{V PCM Bias (Step 22.g)}]}{\text{SCA Input (Step 121)}} = 1 (\pm 10\%)$

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APOLLO G&N  
EQUIPMENT TEST  
DATA SHEET 15 OF 19

JDC  
NO. 12620  
REV. J

JOB LEM SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

JDC ITEM NO.	CALCULATIONS
B. 126	$\text{IG 1X Resolver Cos } (135^\circ) =$ $8.5 \times \frac{[\text{SCA Output (Step 125, 106)} - 2.5\text{V PCM Bias (Step 22.g)}]}{\text{SCA Input (Step 125, 105)}} = -1 (\pm 10\%)$
B. 128	$\text{MG 1X Resolver Cos } (135^\circ) =$ $8.5 \times \frac{[\text{SCA Output (Step 127, 108)} - 2.5\text{V PCM Bias (Step 22.g)}]}{\text{SCA Input (Step 127, 109)}} = -1 (\pm 10\%)$
B. 130	$\text{OG 1X Resolver Cos } (135^\circ) =$ $8.5 \times \frac{[\text{SCA Output (Step 129, 112)} - 2.5\text{V PCM Bias (Step 22.g)}]}{\text{SCA Input (Step 129, 111)}} = -1 (\pm 10\%)$
B. 132	$\text{IG 1X Resolver Sin } (135^\circ) =$ $8.5 \times \frac{[\text{SCA Output (Step 131, 114)} - 2.5\text{V PCM Bias (Step 22.g)}]}{\text{SCA Input (Step 131, 115)}} = 1 (\pm 10\%)$
B. 134	$\text{MG 1X Resolver Sin } (135^\circ) =$ $8.5 \times \frac{[\text{SCA Output (Step 133, 118)} - 2.5\text{V PCM Bias (Step 22.g)}]}{\text{SCA Input (Step 133, 117)}} = 1 (\pm 10\%)$

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APOLLO G&N  
EQUIPMENT TEST  
DATA SHEET 16 OF 19

JDC  
NO. 12620  
REV. J

JOB LEM SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

JDC ITEM NO.	CALCULATIONS
B. 136	$\text{OG 1X Resolver Sin } (135^\circ) =$ $8.5 \times \frac{[\text{SCA Output (Step 135, 120)} - 2.5\text{V PCM Bias (Step 22.g)}]}{\text{SCA Input (Step 135, 121)}} = 1 (\pm 10\%)$
B. 140	$\text{IG 1X Resolver Cos } (225^\circ) =$ $8.5 \times \frac{[\text{SCA Output (Step 139, 106)} - 2.5\text{V PCM Bias (Step 22.g)}]}{\text{SCA Input (Step 139, 105)}} = -1 (\pm 10\%)$
B. 142	$\text{MG 1X Resolver Cos } (225^\circ) =$ $8.5 \times \frac{[\text{SCA Output (Step 141, 108)} - 2.5\text{V PCM Bias (Step 22.g)}]}{\text{SCA Input (Step 141, 109)}} = -1 (\pm 10\%)$
B. 144	$\text{OG 1X Resolver Cos } (225^\circ) =$ $8.5 \times \frac{[\text{SCA Output (Step 143, 112)} - 2.5\text{V PCM Bias (Step 22.g)}]}{\text{SCA Input (Step 143, 111)}} = -1 (\pm 10\%)$
B. 146	$\text{IG 1X Resolver Sin } (225^\circ) =$ $8.5 \times \frac{[\text{SCA Output (Step 145, 114)} - 2.5\text{V PCM Bias (Step 22.g)}]}{\text{SCA Input (Step 145, 115)}} = -1 (\pm 10\%)$

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APOLLO G&N  
EQUIPMENT TEST  
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JDC  
NO. 12620  
REV. J

JOB LEM SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

JDC ITEM NO.	CALCULATIONS
B. 148	$\text{MG 1X Resolver Sin } (225^\circ) =$ $8.5 \times \frac{[\text{SCA Output (Step 147, 118)} - 2.5\text{V PCM Bias (Step 22.g)}]}{\text{SCA Input (Step 147, 117)}} = -1 (\pm 10\%)$
B. 150	$\text{OG 1X Resolver Sin } (225^\circ) =$ $8.5 \times \frac{[\text{SCA Output (Step 149, 120)} - 2.5\text{V PCM Bias (Step 22.g)}]}{\text{SCA Input (Step 149, 121)}} = -1 (\pm 10\%)$
B. 154	$\text{IG 1X Resolver Cos } (315^\circ) =$ $8.5 \times \frac{[\text{SCA Output (Step 153, 106)} - 2.5\text{V PCM Bias (Step 22.g)}]}{\text{SCA Input (Step 153, 105)}} = 1 (\pm 10\%)$
B. 156	$\text{MG 1X Resolver Cos } (315^\circ) =$ $8.5 \times \frac{[\text{SCA Output (Step 155, 108)} - 2.5\text{V PCM Bias (Step 22.g)}]}{\text{SCA Input (Step 155, 109)}} = 1 (\pm 10\%)$
B. 158	$\text{OG 1X Resolver Cos } (315^\circ) =$ $8.5 \times \frac{[\text{SCA Output (Step 157, 112)} - 2.5\text{V PCM Bias (Step 22.g)}]}{\text{SCA Input (Step 157, 111)}} = 1 (\pm 10\%)$

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JOB LEM SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

JDC ITEM NO.	CALCULATIONS
B. 160	IG IX Resolver Sin (315°) = $8.5 \times \frac{\text{SCA Output (Step 159, 114)} - 2.5\text{V PCM Bias (Step 22, g)}}{\text{SCA Input (Step 159, 115)}} = -1 (\pm 10\%)$
B. 162	MG IX Resolver Sin (315°) = $8.5 \times \frac{\text{SCA Output (Step 161, 118)} - 2.5\text{V PCM Bias (Step 22, g)}}{\text{SCA Input (Step 161, 117)}} = -1 (\pm 10\%)$
B. 164	OG IX Resolver Sin (315°) = $8.5 \times \frac{\text{SCA Output (Step 163, 120)} - 2.5\text{V PCM Bias (Step 22, g)}}{\text{SCA Input (Step 163, 121)}} = -1 (\pm 10\%)$
B. 199	Yaw Attitude Error = $2.44 \times \frac{\text{SCA Output (Step 198)} - 2.5\text{V PCM Bias (Step 22, g)}}{\text{SCA Input (Step 197)}} = 1 (\pm 10\%)$
B. 202	Pitch Attitude Error = $2.44 \times \frac{\text{SCA Output (Step 201)} - 2.5\text{V PCM Bias (Step 22, g)}}{\text{SCA Input (Step 200)}} = 1 (\pm 10\%)$

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JOB LEM SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

JDC ITEM NO.	CALCULATIONS
B. 205	Roll Attitude Error = $2.44 \times \frac{\text{SCA Output (Step 204)} - 2.5\text{V PCM Bias (Step 22, g)}}{\text{SCA Input (Step 203)}} = 1 (\pm 10\%)$

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FORM 00-48  
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**SUBSYSTEM** LEM G & N SYSTEM  
**DESCRIPTION** This JDC provides a functional checkout procedure for the Signal Conditioner / Assembly. Functional data is evaluated by checking Signal Conditioner Assembly input and output data for proper correlation. Procedural methods are incorporated to cause signal generation in normally null loops where possible in a G and N test configuration for maximum checkout capability.

Rev.	Let.	Date	TORR NO.	PAGES REVISED	APPROVAL	REFERENCES
A	8-24-67	34449	ALL	D.S.	MIT NASA	PS 6015000
B	8-31-67	34478	1, 2, 4-8, 10, 11-13, 12, 15-17		EA 42	JDC 12614 JDC 18100
C	10-10-67	34802	12		EA 42	IMPORTANT See below
D	1-12-68	35421	1, 2, 4-12, 15, 16, 18		EA 42	INTERVAL
E	2-6-68	35561	7, 12, 13, 3		EA 42	
F	3-28-68	35977	1, 3-5-8, 4, 5, 12, 13		EA 42	TOOLS AND MATERIAL
G	7-25-68	36586	1, 9, 10, 12		EA 42	
H	9-26-68	36861	1		EA 42	
I	12-2-68	37073	ALL		EA 42	
K	2-24-69	37363	1, 2, 5, 6, 19, 1, 2, 3		EA 42	

**IMPORTANT:** 1. Insure that connector assembly (2003099) is connected to the LGC test connector. 2. Step numbers preceded by an asterisk are not to be performed when testing with LEM.

- A. PREPARATION**
- Perform, if applicable, JDC 12614 to downmode to OIA on mode.  
NOTE: If SCA has been previously installed in system configuration prior to performance of this JDC, proceed with step A. 7; if installation is required, proceed with step A. 2.
  - Remove DSKY Mounting Pedestal

**VERIFICATION WITH SIDL REQUIRED BEFORE USE**

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FOR 104 13A  
Ch. 3-13-68

**SUBSYSTEM** LEM G & N SYSTEM

and DSKY from Component Mounting Plate following detachment of ground strap and demating of cable W143 to DSKY.

**CAUTION:** Extreme care must be exercised when mating connectors to prevent pin and socket damage.

3. Visually inspect J2 on Signal Conditioner Module (SCM) breakout box and 30J1 on SCA to insure that pins and sockets are not bent or damaged.

4. Carefully locate J2 on guide pins of 30J1; ease plug onto connector, maintaining parallelism between plug and connector as closely as possible; and engage Jackscrews until finger tight.

5. Turn each Jackscrew one turn at a time moving around connector in sequence until plug and connector are fully engaged.

6. Reinstall DSKY Mounting Pedestal with DSKY on Component Mounting Plate, attach ground strap and mate cable W143 to DSKY.

7. Connect cable W157-P1 to 30J2 on SCM breakout box and W157-P2 to P1 on cable W142. Insure that all other cables are connected to the SCM as shown in JDC 12609.

7A. Perform JDC 12614 to place G and N system in ISS STANDBY mode with LGC operating.

**NOTE:** The 28 VDC G&N Power adjusted in step 8 will vary as result of heater cycling.

8. Set CROSSBAR CONTROL on Primary Signal Selector panel to 120 and adjust G&N

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**SUBSYSTEM** LEM G & N SYSTEM

2. Set Test Selector panel to 101 to measure and record 28 vdc LGC operate voltage (GG1523X) on DVM.

3. Set Test Selector panel to 102 to measure and record 28 vdc IMU standby voltage (GG1513X) on DVM.

**PIPA S/G OUTPUT**

4. Connect following signals to Oscillograph by setting switches on Oscillograph Signal Selector panel to positions indicated:

**Switch**  
CHANNEL 4 to 1 Z PIPA S/G output (GG2041V)  
CHANNEL 5 to 1 Y PIPA S/G output (GG2021V)  
CHANNEL 6 to 1 X PIPA S/G output (GG2001V)  
CHANNEL 8 to 4 SCA GDB stepper switch

5. Insure that CH4AC, CH5AC, and CH6AC pushbuttons are lighted.

6. Set sensitivities on Oscillograph Amplifiers for channels 4, 5, and 6 to 500 MV/MM and set sensitivity on channel 8 to 5 V/MM. Use ZERO ADJ control to center all traces.

7. Perform the following DSKY operations:

a. VERB 36 ENTR  
b. VERB 41 NOUN 20 ENTR  
Observe:  
VERB 21 NOUN 22 Flashing

Test Selector Panel Position	Signal
117	Z PIPA G/S in-phase out.
118	Y PIPA G/S in-phase out.
119	X PIPA G/S in-phase out.

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**SUBSYSTEM** LEM G & N SYSTEM

12. Observe channel 8 for indication of PIPA loop opening for approximately 30 seconds then closing. Stop oscillograph. Record PIPA loop closure test results as satisfactory if loop closure indication on channel 8 corresponds to loop closure indication on channel 4, 5, or 6.

13. Perform the following DSKY operations:  
a. VERB 41 NOUN 20 ENTR  
Observe:  
VERB 21 NOUN 22 Flashing  
b. +00000  
Observe:  
VERB 22 NOUN 22 Flashing  
c. -22500  
Observe:  
VERB 23 NOUN 22 Flashing  
d. -03500  
Observe:  
VERB 23 NOUN 22 Flashing  
e. \*202  
Observe:  
VERB 23 NOUN 22 Flashing  
f. 103  
Observe:  
VERB 23 NOUN 22 Flashing  
g. 104  
Observe:  
VERB 23 NOUN 22 Flashing  
h. 106  
Observe:  
VERB 23 NOUN 22 Flashing  
i. 113  
Observe:  
VERB 23 NOUN 22 Flashing

14. Repeat steps 9 through 12 then set all Oscillograph Amplifier sensitivities to OFF.

15. through 19. (Deleted)

20. Set CROSSBAR CONTROL on Primary Signal Selector panel to 173 and adjust G&N POWER ADJUST control on Test Control panel until DVM indicates 28 (±0.25) vdc. Record DVM indication.

21. Set CROSSBAR CONTROL on Primary Signal Selector panel to 271.

22. Set Test Selector panel to positions listed below and measure and record DVM indication for each position:

**NOTE:** SCA TEST TMC INHIBIT indicator on Temperature Monitor Control

IG, MG, AND OG SERVO ERRORS

23. Perform following DSKY operations:  
a. VERB 36 ENTR  
b. VERB 41 NOUN 20 ENTR

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LEM SIGNAL CONDITIONER JOB FUNCTIONAL CHECKOUT			JDC 12620 REV K PAGE 5 OF 13
SUBSYSTEM LEM G & N SYSTEM		ASSY	
c. Observe:			28. Set GIMBAL SERVO TEST switch on Test Selector panel to 1 and set CROSSBAR CONTROL on Primary Signal Selector panel to 135 to monitor IG servo error signal on PAVM. (Input to SCA.)
VERB 21	NOUN 22	Flashing	
d. +00000		ENTR	29. Connect decade inductance to PSA TPA test points TB5-32 (high) and TB5-40 (low).
e. Observe:			30. Set Test Selector panel to 137.
VERB 22	NOUN 22	Flashing	31. Press to light TEST START pushbutton on Test Selector panel to 2.
f. +00000		ENTR	31A. Set SCOPE "A" INPUT SIGNAL switch on Primary Signal Selector panel to SIG 1 and SCOPE "A" INPUT REFERENCE switch to 3.
g. Observe:			31B. Monitor lissajous pattern on Oscilloscope and adjust decade inductance until lissajous pattern indicates minimum phase shift.
VERB 23	NOUN 22	Flashing	31C. Measure and record both right and left maximum meter deflection of PAVM. Add the absolute values and record result as maximum meter spread. (SCA input.)
h. +00000		ENTR	31D. Set CROSSBAR CONTROL on Primary Signal Selector panel to 271 and measure and record both high and low voltage indications on DVM. Subtract low voltage from high voltage and record result as maximum meter spread. (SCA output.)
1. VERB 21	NOUN 01	ENTR	32. Press TEST STOP pushbutton on Test Selector panel. TEST START pushbutton shall go out.
J. 00403		ENTR	33. Calculate IG servo error SCA output: to IG servo error SCA input as follows.
k. 00000		ENTR	
1. NOUN 15		ENTR	
m. 00000		ENTR	
n. 00000		ENTR	
o. 00000		ENTR	
p. 00000		ENTR	
q. 00000		ENTR	
24. Set switches on Signal Generator as follows:			
a. RANGE to X. 01			
b. FREQUENCY meter to 6. 0			
c. FUNCTION to SQUARE			
d. DC BALANCE to midposition			
e. AMPLITUDE to 70.			
25. Perform following DSKY operations:			
a. VERB 42		ENTR	
b. VERB 33		ENTR	
26. Set FUNCTION switch on PAVM to 0° and FREQUENCY switch to 3200.			
27. Press to light GIMBAL SERVO TEST pushbutton on Test Selector panel.			

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LEM SIGNAL CONDITIONER JOB FUNCTIONAL CHECKOUT			JDC 12620 REV K PAGE 6 OF 19
SUBSYSTEM LEM G & N SYSTEM		ASSY	
Record result:			MG servo error =
IG servo error =			Step 37, max meter spread
Step 31, max meter spread			Step 35, max meter spread = 0. 91 (±15%)
Step 29, max meter spread			39. Set CROSSBAR CONTROL on Primary Signal Selector panel to 133 to monitor OG servo error on PAVM.
34. Set CROSSBAR CONTROL on Primary Signal Selector panel to 134 to monitor MG servo error on PAVM.			40. Connect decade inductance to PSA TPA test points TB5-41 (high) and TB5-40 (low).
35. Connect decade inductance to PSA TPA test points TB5-41 (high) and TB5-40 (low).			41. Set GIMBAL SERVO TEST switch on Test Selector panel to 3.
36. Set GIMBAL SERVO TEST switch on Test Selector panel to 2.			42. Set Test Selector panel to 139.
37. Test Test Selector panel to 138.			42A. Press to light TEST START pushbutton.
37A. Press to light TEST START pushbutton.			42B. Monitor lissajous pattern on Oscilloscope and adjust decade inductance until lissajous pattern indicates minimum phase shift.
37B. Monitor lissajous pattern on Oscilloscope and adjust decade inductance until lissajous pattern indicates minimum phase shift.			42C. Measure and record both right and left maximum meter deflection of PAVM. Add the absolute values and record result as maximum meter spread. (SCA input.)
37C. Measure and record both right and left maximum meter deflection of PAVM. Add the absolute values and record result as maximum meter spread. (SCA input.)			42D. Set CROSSBAR CONTROL on Primary Signal Selector panel to 271 and measure and record both high and low voltage indications on DVM. Subtract low voltage from high voltage and record result as maximum meter spread. (SCA output.)
37D. Set CROSSBAR CONTROL on Primary Signal Selector panel to 271 and measure and record both high and low voltage indications on DVM. Subtract low voltage from high voltage and record result as maximum meter spread. (SCA output.)			42E. Press TEST STOP pushbutton on Test Selector panel. TEST START pushbutton shall go out.
37E. Press TEST STOP pushbutton on Test Selector panel. TEST START pushbutton shall go out.			38. Calculate MG servo error SCA output to MG servo error SCA input as follows.
38. Calculate MG servo error SCA output to MG servo error SCA input as follows.			Record result.

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LEM SIGNAL CONDITIONER JOB FUNCTIONAL CHECKOUT			JDC 12620 REV K PAGE 7 OF 19
SUBSYSTEM LEM G & N SYSTEM		ASSY	
43. Calculate OG servo error SCA output to OG servo error SCA input as follows:			*53. Press to light GIMBAL SERVO TEST pushbutton on Test Selector panel.
Record result.			*54. Connect PSA TPA direct probes to TB2-31 (high) and TB1-49 (low) to monitor IG torque motor current on channel 6. (Input to SCA.)
OG servo error =			*55. Set Test Selector panel to 132 and GIMBAL SERVO TEST switch to 1 to monitor IG torque motor current on channel 8. (Output of SCA.)
Step 42, max meter spread = 0. 91 (±15%)			*56. Press to light TEST START pushbutton.
44. Press to extinguish GIMBAL SERVO TEST pushbutton on Test Selector panel.			*57. Increase Signal Generator AMPLITUDE control until Oscilloscope indicates 2 volts peak-to-peak. Maintain Signal Generator AMPLITUDE control setting for approximately 10 seconds, then set AMPLITUDE control to 0.
*IG, MG, AND OG TORQUE MOTOR CURRENTS (GG2110C, GG2140C, AND GG2170C)			*58. Press TEST STOP pushbutton on Test Selector panel. TEST START pushbutton shall go out.
*45. Insure that AMPLITUDE control on Signal Generator is set to 0.			*59. Set CHART DRIVE switch on Oscilloscope graph Control panel to CM/HR. Measure and record peak-to-peak SCA input signal monitored on channel 6 and peak-to-peak SCA output signal monitored on channel 8.
*46. Connect jumper between PROBES OUTPUT DIRECT jacks and CH6DC IN jacks on Auxiliary Input panel.			*60. Set CHART DRIVE switch on Oscilloscope graph Control panel to MM/SEC.
*47. Set OSCILLOGRAPH SELECTOR CHANNEL 6 switch on Oscillograph Signal Selector panel to 15.			*61. Connect PSA TPA direct probes to TB2-32 (high) and TB1-49 (low) to monitor MG torque motor current on channel 6. (Input to SCA.)
*48. Insure that CH6DC indicator is lighted.			*62. Press to light TEST START pushbutton.
*49. Zero Oscillograph channel 6 and set sensitivity to 0. 2 V/CM. Set sensitivity of channel 8 to 2 V/CM and zero adjust channel 8 for a centered trace with a 2. 5 vdc bias input by off-setting zero line 12. 5 mm to right of chart center line.			
*50. Set FREQUENCY meter on Signal Generator to 5 and RANGE switch to X10.			
*51. Set CHART DRIVE switch on Oscilloscope graph Control panel to MM/SEC.			
*52. Set CROSSBAR CONTROL on Primary Signal Selector panel to 176 to monitor Signal Generator output on Oscilloscope.			

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LEM SIGNAL CONDITIONER JOB FUNCTIONAL CHECKOUT			JDC 12620 REV K PAGE 8 OF 19
SUBSYSTEM LEM G & N SYSTEM		ASSY	
*63. Increase Signal Generator AMPLITUDE control until Oscilloscope indicates 1 volt peak-to-peak. Maintain Signal Generator AMPLITUDE control setting for approximately 10 seconds, then set AMPLITUDE control to 0.			record peak-to-peak SCA input signal monitored on channel 6 and peak-to-peak SCA output signal monitored on channel 8.
*64. Press TEST STOP pushbutton on Test Selector panel. TEST START pushbutton shall go out.			*IG, MG, AND OG CDU FINE ERRORS (GG2220, GG2250, AND GG2280)
*65. Set CHART DRIVE switch on Oscilloscope graph Control panel to CM/HR. Measure and record peak-to-peak SCA input signal monitored on channel 6 and peak-to-peak SCA output signal monitored on channel 8.			*72. Perform following DSKY operations:
*66. Set CHART DRIVE switch on Oscilloscope graph Control panel to MM/SEC.			a. VERB 41 NOUN 20 ENTR
*67. Connect PSA TPA direct probes to TB1-45 (high) and TB1-49 (low) to monitor OG torque motor current on channel 6. (Input to SCA.)			b. Observe:
*68. Press to light TEST START pushbutton.			VERB 21 NOUN 22 Flashing
*69. Increase Signal Generator AMPLITUDE control until Oscilloscope indicates 1 volt peak-to-peak. Maintain Signal Generator AMPLITUDE control setting for approximately 10 seconds, then set AMPLITUDE control to 0.			c. +00000 ENTR
*70. Press TEST STOP pushbutton on Test Selector panel. TEST START pushbutton shall go out.			d. Observe:
*71. Set CHART DRIVE switch on Oscilloscope graph Control panel to CM/HR. Measure and			VERB 22 NOUN 22 Flashing
			e. +00000 ENTR
			f. Observe:
			VERB 23 NOUN 22 Flashing
			g. +00000 ENTR
			*73. Connect jumper between PROBES OUTPUT BUFFERED jacks and PAVM IN jacks on Auxiliary Input panel.
			*74. Perform following DSKY operations:
			a. VERB 21 NOUN 01 ENTR
			b. 00370 ENTR
			c. 16002 ENTR
			d. VERB 57 ENTR
			e. 00003 ENTR
			f. Observe:
			VERB 06 NOUN 61 Flashing
			g. VERB 21 ENTR
			h. +00000 ENTR
			i. VERB 22 ENTR
			j. Site Latitude (from Table II) ENTR
			k. VERB 33 ENTR

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LEM SIGNAL CONDITIONER  
JOB FUNCTIONAL CHECKOUT

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SUBSYSTEM LEM G & N SYSTEM		ASSY
1. 00004	ENTR	*79. Connect PSA TPA buffered probes to TB3-37 (high) and TB3-34 (low) to monitor IG CDU fine error signal on PAVM. (Input to SCA.)
m. 00001	ENTR	
n. Observe:		
VERB 21	NOUN 22	Flashing
o. +00100	ENTR	
p. Observe:		
VERB 22	NOUN 22	Flashing
q. +00100	ENTR	
r. Observe:		
VERB 23	NOUN 22	Flashing
s. +00100	ENTR	
Table II		
Test Site	Latitude	
MIT	+42.366	
AC	+42.902	
GAEC	+40.748	
MSC	+29.556	
KSC	+28.524	
NAA	+33.921	
*75. Within 10 to 90 seconds after performance of step 74, s. perform following DSKY operations:		
a. VERB 21	NOUN 01	ENTR
b. 02512	ENTR	
c. 00000	ENTR	
d. VERB 16	NOUN 20	ENTR
*76. Record DSKY Row 1, Row 2, and Row 3 indications.		
*77. Approximately 120 seconds after performance of step 76, record DSKY Row 1, Row 2, and Row 3 indications.		
*78. Set Test Selector panel to 145 and CROSSBAR CONTROL on Primary Signal Selector panel to 271. Record R&D 2.5 vdc bias voltage indicated on DVM.		

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LEM SIGNAL CONDITIONER  
JOB FUNCTIONAL CHECKOUT

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SUBSYSTEM LEM G & N SYSTEM		ASSY
*86. Calculate SCA output MG CDU fine error to SCA input MG CDU fine error as follows. Record result:		b. Observe:
MG CDU fine error =		VERB 21
Step 85 (vdc) - Step 78 = 1 (±20%)		NOUN 22
2.00 x Step 85 (vac)		Flashing
*87. Connect PSA TPA buffered probes to TB3-41 (high) and TB3-34 (low) to monitor OG CDU fine error signal on PAVM. (Input to SCA.)		c. +01000
*88. Set Test Selector panel to 142 to monitor OG CDU fine error signal on DVM. (Output of SCA.)		d. Observe:
		VERB 22
		NOUN 22
		Flashing
		e. +01000
		ENTR
		f. Observe:
		VERB 23
		NOUN 22
		Flashing
		ENTR
		g. +01000
		ENTR
		*89. Enter VERB 16 NOUN 20 into DSKY and press ENTR pushbutton. Verify that Row 1, Row 2, and Row 3 indicate approximately +01000.
		*94. Set Test Selector panel to 203 and measure and record OG 1X resolver sin voltage indicated on DVM. (Output of SCA.)
		*95. Set CROSSBAR CONTROL on Primary Signal Selector panel to 142 and measure and record OG 1X resolver sin voltage indicated on DVM. (Input to SCA.)
		*96. Calculate SCA output OG 1X resolver sin to SCA input OG 1X resolver sin as follows. Record results:
		OG 1X resolver sin (±10°) =
		2 (Step 94 - Step 22. g) = 1 (±10%)
		Step 95
		*97. Set CROSSBAR CONTROL on Primary Signal Selector panel to 144 and measure and record IG 1X resolver sin voltage indicated on DVM. (Input to SCA.)
		*98. Set CROSSBAR CONTROL on Primary Signal Selector panel to 271 and set Test Selector panel to 204. Measure and record IG 1X resolver sin voltage indicated on DVM. (Output of SCA.)

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SUBSYSTEM LEM G & N SYSTEM		ASSY
*99. Calculate SCA output IG 1X resolver sin to SCA input IG 1X resolver sin as follows. Record results:		
IG 1X resolver sin (±10°) =		
2 (Step 98 - Step 22. g) = 1 (±10%)		
		Step 97
*100. Set Test Selector panel to 205 and measure and record MG 1X resolver sin voltage indicated on DVM. (Output of SCA.)		
*101. Set CROSSBAR CONTROL on Primary Signal Selector panel to 143 and measure and record MG 1X resolver sin voltage indicated on DVM. (Input to SCA.)		
*102. Calculate SCA output MG 1X resolver sin to SCA input MG 1X resolver sin as follows. Record results:		
MG 1X resolver sin (±10°) =		
2 (Step 100 - Step 22. g) = 1 (±10%)		
		Step 101
IG, MG, AND OG 1X RESOLVER SIN AND COS		
109. Perform following DSKY operations:		
a. VERB 41	NOUN 20	ENTR
b. Observe:		
VERB 21	NOUN 22	Flashing
c. +04500	ENTR	
d. Observe:		
VERB 22	NOUN 22	Flashing
e. +04500	ENTR	
f. Observe:		
VERB 23	NOUN 22	Flashing
g. +04500	ENTR	
h. VERB 16	NOUN 20	ENTR
104. Record DSKY Row 1, Row 2, and Row 3 indications.		

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SUBSYSTEM LEM G & N SYSTEM		ASSY
Selector panel to 122. Measure and record OG 1X resolver cos voltage indicated on DVM. (Output of SCA.)		
113. Calculate SCA output OG 1X resolver cos to SCA input OG 1X resolver cos as follows. Record result:		
OG 1X resolver cos (45°) =		
8.5 (Step 112 - Step 22. g) = 1 (±10%)		
		Step 111
114. Set Test Selector panel to 123 and measure and record IG 1X resolver sin voltage indicated on DVM. (Output of SCA.)		
115. Set CROSSBAR CONTROL on Primary Signal Selector panel to 144 and measure and record IG 1X resolver sin voltage indicated on DVM. (Input to SCA.)		
116. Calculate SCA output IG 1X resolver sin to SCA input IG 1X resolver sin as follows. Record result:		
IG 1X resolver sin (45°) =		
8.5 (Step 114 - Step 22. g) = 1 (±10%)		
		Step 115
117. Set CROSSBAR CONTROL on Primary Signal Selector panel to 143 and measure and record MG 1X resolver sin voltage indicated on DVM. (Input to SCA.)		
118. Set CROSSBAR CONTROL on Primary Signal Selector panel to 271 and set Test Selector panel to 124. Measure and record MG 1X resolver sin voltage indicated on DVM. (Output of SCA.)		
119. Calculate SCA output MG 1X resolver sin to SCA input MG 1X resolver sin as follows. Record result:		

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SUBSYSTEM	LEM G & N SYSTEM	ASSY
*180. Perform following DSKY operations:		
a. VERB 21 NOUN 10 ENTR		
b. 00012 ENTR		
c. 00010 ENTR		
RR SHAFT AND TRUNNION 1X RESOLVER SH AND COS		
NOTE: G/N CAUTION lamp on Monitor panel and PROG lamp on DSKY will light during performance of steps 181 through 194.		
181. Perform following DSKY operations:		
a. VERB 36 ENTR		
b. VERB 40 NOUN 40 ENTR		
182. Set following switches on DEB and RCT Control panels:		
a. DEB - REFERENCE QUADRANT to 0°-90°.		
b. DEB - SENSITIVITY fully CCW.		
c. RCT - Insure that one of the three operating channel indicators (IG, MG, or OG SELECT) is lighted. Insure that READ RATE TABLE INPUT and LORS RATE TABLE CONTROL Indicators are not lighted.		
d. RCT - SET MODE lighted.		
e. DEB - DEGREES to 0+45.000.		
f. RCT - MON COARSE lighted.		
g. RCT - RESOLVER ANGLE TRANSMITTER to 45.000.		
h. DEB/RCT - Rotate RESOLVER ANGLE TRANSMITTER control and SENSITIVITY COARSE control to null meter.		
183. Press TRUN SELECT/SET ENABLE pushbutton on RCT Control panel. Both halves of pushbutton shall light.		
184. Enter VERB 06 NOUN 40 into DSKY and press ENTR pushbutton. Verify that DSKY Row 1 indicates approximately 045+0 and Row 2 indicates approximately 00000		
185. Insure that CROSSBAR CONTROL on Primary Signal Selector panel is set to 2/1.		
186. Set Test Selector panel to 128. Measure and record trunnion 1X resolver sin voltage output from SCA on DVM.		
187. Set Test Selector panel to 131. Measure and record trunnion 1X resolver cos voltage output from SCA on DVM.		
188. Press SHAFT SELECT/SET ENABLE pushbutton on RCT Control panel. Both halves of pushbutton shall light.		
189. Enter VERB 06 NOUN 40 into DSKY and press ENTR pushbutton. Verify that DSKY Row 1 indicates approximately 00000 and Row 2 indicates approximately 04500.		
190. Set Test Selector panel to 129. Measure and record shaft 1X resolver sin voltage output from SCA on DVM.		

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SUBSYSTEM	LEM G & N SYSTEM	ASSY
191. Set Test Selector panel to 130. Measure and record shaft 1X resolver cos voltage output from SCA on DVM.		
192. Set RESOLVER ANGLE TRANSMITTER control to 0.		
193. Set 800 ~ REFERENCE INPUT VOLTAGE switch on DEB to OFF.		
YAW, PITCH, AND ROLL ATTITUDE ERRORS		
194. Perform following DSKY operations:		
a. VERB 36 ENTR		
b. VERB 41 NOUN 20 ENTR		
c. Observe:		
VERB 21 NOUN 22 Flashing		
d. +00000 ENTR		
e. Observe:		
VERB 22 NOUN 22 Flashing		
f. +00000 ENTR		
g. Observe:		
VERB 23 NOUN 22 Flashing		
h. +00000 ENTR		
NOTE: ISS WARNING lamp on Monitor panel may light during performance of step 195. Ignore lamp indication.		
195. Perform following DSKY operations:		
a. VERB 21 NOUN 10 ENTR		
b. 00012 ENTR		
c. 00060 ENTR		
d. VERB 43 ENTR		
e. Observe:		
VERB 21 NOUN 22 Flashing		
f. +01600 ENTR		
196. Connect PSA TPA direct probes to TB4-43 (high) and TB4-47 (low) and measure and record yaw attitude error total voltage indicated on PAVM. (Input to SCA.)		
198. Set Test Selector panel to 114 and measure and record yaw attitude error voltage indicated on DVM. (Output of SCA.)		
199. Calculate SCA output yaw attitude error to SCA input yaw attitude error as follows. Record result:		
Yaw attitude error =		
2.44 (Step 198 - Step 22.g) = 1 (±10%)		
Step 197		
200. Connect PSA TPA direct probes to TB4-45 (high) and TB4-49 (low) and measure and record pitch attitude error total voltage indicated on PAVM. (Input to SCA.)		
201. Set Test Selector panel to 115 and measure and record pitch attitude error voltage indicated on DVM. (Output of SCA.)		
202. Calculate SCA output pitch attitude error to SCA input pitch attitude error as follows. Record result:		
Pitch attitude error =		
2.44 (Step 198 - Step 22.g) = 1 (±10%)		

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SUBSYSTEM	LEM G & N SYSTEM	ASSY
203. Connect PSA TPA direct probes to TB4-44 (high) and TB4-48 (low) and measure and record roll attitude error total voltage indicated on PAVM. (Input to SCA.)		
204. Set Test Selector panel to 116 and measure and record roll attitude error voltage indicated on DVM. (Output of SCA.)		
205. Calculate SCA output roll attitude error to SCA input roll attitude error as follows. Record result:		
Roll attitude error =		
2.44 (Step 204 - Step 22.g) = 1 (±10%)		
Step 203		
206. Perform following DSKY operations:		
a. VERB 36 ENTR		
b. VERB 41 NOUN 20 ENTR		
c. Observe:		
VERB 21 NOUN 22 Flashing		
d. +00000 ENTR		
e. Observe:		
VERB 22 NOUN 22 Flashing		
f. +00000 ENTR		
g. Observe:		
VERB 23 NOUN 22 Flashing		
h. +00000 ENTR		
207. Press POWER ON pushbutton on RCT Control panel. The pushbutton shall extinguish.		
208. Disconnect cable W172 from GDB.		

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LEM SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

ASSEMBLY UNDER TEST				TEST HISTORY			
TITLE	DATE	START	END	SITE	LOCATION		
SER. NO.	DWG	REV.	TIME	START	END	TOTAL ELAPSED	
MAJOR GROUND SUPPORT EQUIPMENT							
NAME	SER. NO.	SER. NO.	CAL. DATE				
NAME	SER. NO.	SER. NO.	CAL. DATE				
CONDUCTED BY				APPROVED BY			
NAME/AFFILIATION				NAME/AFFILIATION			
JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
A. 8	Bus voltage	vdc	27.00		29.00		
B. 2	28 vdc I/JC operate	vdc	3.9		4.8		
B. 3	28 vdc IMU standby	vdc	3.9		4.8		
B. 12	Loop closure (channel 8 to 4)						
	Loop closure (channel 8 to 5)						
	Loop closure (channel 8 to 6)						
B. 14 (B. 12)	Loop closure (channel 8 to 4)						
	Loop closure (channel 8 to 5)						
	Loop closure (channel 8 to 6)						
B. 20	Bus voltage	vdc	27.75		28.25		
B. 22.a	*Cal Mod Temp	vdc	0.40		1.26		
B. 22.b	*R&D 2.5vdc bias	vdc	2.47		2.53		



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JOB LEM SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ ACC
B. 22. c	*IMU heater current	vdc	3. 9		4. 8	
B. 22. d	PIPA Temp	vdc	2. 0		3. 0	
B. 22. c	*IRIG Temp	vdc	2. 37		3. 70	
B. 22. f	120 vdc reference	vdc	2. 80		4. 20	
B. 22. g	2. 5 vdc PCM bias	vdc	2. 47		2. 53	
B. 22. h	3200 cps, 28v supply	vdc	4. 20		4. 80	
B. 22. i	800 cps, 28v supply	vdc	4. 20		4. 80	
B. 31C	Maximum right	vac				
	Maximum left	vac				
	Maximum meter spread (IG servo error, SCA input)	vac				
B. 31D	Maximum high	vdc				
	Maximum low	vdc				
	Maximum meter spread (IG servo error, SCA output)	vdc				
B. 33	IG servo error		0. 77		1. 05	
B. 37C	Maximum right	vac				
	Maximum left	vac				
	Maximum meter spread (MG servo error, SCA input)	vac				

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JOB LEM SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ ACC
B. 37D	Maximum high	vdc				
	Maximum low	vdc				
	Maximum meter spread (MG servo error, SCA output)	vdc				
B. 38	MG servo error		0. 77		1. 05	
B. 42C	Maximum right	vac				
	Maximum left	vac				
	Maximum meter spread (OG servo error, SCA input)	vac				
B. 42D	Maximum high	vdc				
	Maximum low	vdc				
	Maximum meter spread (OG servo error, SCA output)	vdc				
B. 43	OG servo error		0. 77		1. 05	
B. 59	*IG TMC (Channel 6)	v p-p				
	*IG TMC (Channel 8)	v p-p	Channel 6 x 5. 0 -15%		Channel 6 x 5. 0 +15%	
B. 65	*MG TMC (Channel 6)	v p-p				
	*MG TMC (Channel 8)	v p-p	Channel 6 x 5. 0 -15%		Channel 6 x 5. 0 +15%	

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JOB LEM SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ ACC
B. 71	*OG TMC (Channel 6)	v p-p				
	*OG TMC (Channel 8)	v p-p	Channel 6 x 2. 75 -15%		Channel 6 x 2. 75 +15%	
B. 76	*Row 1	deg				
	*Row 2	deg				
	*Row 3	deg				
B. 77	*Row 1	deg				
	*Row 2	deg				
	*Row 3	deg				
B. 78	*R&D 2. 5 vdc bias	vdc				
B. 81	*IG CDU fine error (PAVM)	vac				
	*IG CDU fine error (DVM)	vdc				
B. 82	*IG CDU fine error		0. 80		1. 20	
B. 85	*MG CDU fine error (PAVM)	vac				
	*MG CDU fine error (DVM)	vdc				
B. 86	*MG CDU fine error		0. 80		1. 20	
B. 89	*OG CDU fine error (PAVM)	vac				
	*OG CDU fine error (DVM)	vdc				

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JOB LEM SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ ACC
B. 90	*OG CDU fine error		0. 80		1. 20	
B. 94	*OG IX resolver	vdc				
B. 95	*OG IX resolver	vac				
B. 96	*OG IX resolver		0. 90		1. 10	
B. 97	*IG IX resolver	vac				
B. 98	*IG IX resolver	vdc				
B. 99	*IG IX resolver		0. 90		1. 10	
B. 100	*MG IX resolver	vdc				
B. 101	*MG IX resolver	vac				
B. 102	*MG IX resolver		0. 90		1. 10	
B. 104	Row 1	deg				
	Row 2	deg				
	Row 3	deg				
B. 105	IG IX resolver cos	vac				
B. 106	IG IX resolver cos	vdc				
B. 107	IG IX resolver cos (45°)		0. 90		1. 10	
B. 108	MG IX resolver cos	vdc				
B. 109	MG IX resolver cos	vac				
B. 110	MG IX resolver cos (45°)		0. 90		1. 10	
B. 111	OG IX resolver cos	vac				

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JOB LEM SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ ACC
B. 112	OG 1X resolver cos	vdc				
B. 113	OG 1X resolver cos (45°)		0.90		1.10	
B. 114	IG 1X resolver sin	vdc				
B. 115	IG 1X resolver sin	vac				
B. 116	IG 1X resolver sin (45°)		0.90		1.10	
B. 117	MG 1X resolver sin	vac				
B. 118	MG 1X resolver sin	vdc				
B. 119	MG 1X resolver sin (45°)		0.90		1.10	
B. 120	OG 1X resolver sin	vdc				
B. 121	OG 1X resolver sin	vac				
B. 122	OG 1X resolver sin (45°)		0.90		1.10	
B. 124	Row 1	deg				
	Row 2	deg				
	Row 3	deg				
B. 125	IG 1X resolver cos	vac				
B. 125 (B. 105)						
B. 125	IG 1X resolver cos	vdc				
B. 126 (B. 106)			-0.90		-1.10	
B. 126	IG 1X resolver cos (135°)					
B. 127 (B. 108)	MG 1X resolver cos	vdc				

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JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ ACC
B. 127	MG 1X resolver cos	vac				
B. 128	MG 1X resolver cos (135°)		-0.90		-1.10	
B. 129	OG 1X resolver	vac				
B. 129 (B. 111)						
B. 129	OG 1X resolver	vdc				
B. 129 (B. 112)						
B. 130	OG 1X resolver cos (135°)		-0.90		-1.10	
B. 131	IG 1X resolver sin	vdc				
B. 131 (B. 114)						
B. 131	IG 1X resolver sin	vac				
B. 132 (B. 115)						
B. 132	IG 1X resolver sin (135°)		0.90		1.10	
B. 133	MG 1X resolver	vac				
B. 133 (B. 117)						
B. 133	MG 1X resolver	vdc				
B. 133 (B. 118)						
B. 134	MG 1X resolver sin (135°)		0.90		1.10	
B. 135	OG 1X resolver	vdc				
B. 135 (B. 120)						
B. 135	OG 1X resolver	vac				
B. 135 (B. 121)						
B. 136	OG 1X resolver sin (135°)		0.90		1.10	

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JOB LEM SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ ACC
B. 138	Row 1	deg				
	Row 2	deg				
	Row 3	deg				
B. 139	IG 1X resolver	vac				
B. 139 (B. 105)						
B. 139	IG 1X resolver	vdc				
B. 140 (B. 106)			-0.90		-1.10	
B. 140	IG 1X resolver cos (225°)					
B. 141	MG 1X resolver	vdc				
B. 141 (B. 108)						
B. 141	MG 1X resolver	vac				
B. 141 (B. 109)						
B. 142	MG 1X resolver cos (225°)		-0.90		-1.10	
B. 143	OG 1X resolver	vac				
B. 143 (B. 111)						
B. 143	OG 1X resolver	vdc				
B. 143 (B. 112)						
B. 144	OG 1X resolver cos (225°)		-0.90		-1.10	
B. 145	IG 1X resolver sin	vdc				
B. 145 (B. 114)						
B. 145	IG 1X resolver	vac				
B. 145 (B. 115)						
B. 146	IG 1X resolver sin (225°)		-0.90		-1.10	

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JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ ACC
B. 147	MG 1X resolver sin	vac				
B. 147 (B. 117)						
B. 147	MG 1X resolver	vdc				
B. 147 (B. 118)						
B. 148	MG 1X resolver sin (225°)		-0.90		-1.10	
B. 149	OG 1X resolver sin	vdc				
B. 149 (B. 120)						
B. 149	OG 1X resolver sin	vac				
B. 149 (B. 121)						
B. 150	OG 1X resolver sin (225°)		-0.90		-1.10	
B. 152	Row 1	deg				
	Row 2	deg				
	Row 3	deg				
B. 153	IG 1X resolver cos	vac				
B. 153 (B. 105)						
B. 153	IG 1X resolver cos	vdc				
B. 153 (B. 106)						
B. 154	IG 1X resolver cos (315°)		0.90		1.10	
B. 155	MG 1X resolver	vdc				
B. 155 (B. 108)						
B. 155	MG 1X resolver	vac				
B. 155 (B. 109)						
B. 156	MG 1X resolver cos (315°)		0.90		1.10	

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JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ ACC
B. 157 (B. 111)	OG 1X resolver cos	vac				
B. 157 (B. 112)	OG 1X resolver cos	vdc				
B. 158 (B. 113)	OG 1X resolver cos (315°)		0.90		1.10	
B. 159 (B. 114)	IG 1X resolver sin	vdc				
B. 159 (B. 115)	IG 1X resolver sin	vac				
B. 160 (B. 116)	IG 1X resolver sin (315°)		-0.90		-1.10	
B. 161 (B. 117)	MG 1X resolver sin	vac				
B. 161 (B. 118)	MG 1X resolver sin	vdc				
B. 162 (B. 119)	MG 1X resolver sin (315°)		-0.90		-1.10	
B. 163 (B. 120)	OG 1X resolver sin	vdc				
B. 163 (B. 121)	OG 1X resolver sin	vac				
B. 164 (B. 122)	OG 1X resolver sin (315°)		-0.90		-1.10	
B. 173	*Shaft CDU fine error	vdc	2.45		2.55	

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JOB LEM SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ ACC
B. 174	*Shaft CDU fine error	vdc	3.75		4.25	
B. 178	*Trunnion CDU fine error	vdc	3.75		4.25	
B. 179	*Trunnion CDU fine error	vdc	2.45		2.55	
B. 186	Trunnion 1X resolver sin	vdc	4.45		4.95	
B. 187	Trunnion 1X resolver cos	vdc	4.45		4.95	
B. 190	Shaft 1X resolver sin	vdc	4.45		4.95	
B. 191	Shaft 1X resolver cos	vdc	4.45		4.95	
B. 197	Yaw attitude error	vac				
B. 198	Yaw attitude error	vdc				
B. 199	Yaw attitude error		0.90		1.10	
B. 200	Pitch attitude error	vac				
B. 201	Pitch attitude error	vdc				
B. 202	Pitch attitude error		0.90		1.10	
B. 203	Roll attitude error	vac				
B. 204	Roll attitude error	vdc				
B. 205	Roll attitude error		0.90		1.10	

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JOB LEM SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

JDC ITEM NO.	CALCULATIONS
B. 33	IG Servo Error = $\frac{\text{SCA output (Step 31, Maximum Meter Spread)}}{\text{SCA input (Step 29, Maximum Meter Spread)}} = 0.91 (\pm 1\%)$
B. 38	MG Servo Error = $\frac{\text{SCA output (Step 37, Maximum Meter Spread)}}{\text{SCA input (Step 35, Maximum Meter Spread)}} = 0.91 (\pm 1\%)$
B. 43	OG Servo Error = $\frac{\text{SCA output (Step 42, Maximum Meter Spread)}}{\text{SCA input (Step 40, Maximum Meter Spread)}} = 0.91 (\pm 1\%)$
B. 82	*IG CDU Fine Error = $\frac{\text{SCA output (Step 81, vdc) - 2.5V R\&D Bias (Step 79)}}{2.00 \times \text{SCA input (Step 81, vac)}} = 1 (\pm 20\%)$
B. 86	*MG CDU Fine Error = $\frac{\text{SCA output (Step 85, vdc) - 2.5V R\&D Bias (Step 78)}}{2.00 \times \text{SCA input (Step 85, vac)}} = 1 (\pm 20\%)$

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JOB LEM SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

JDC ITEM NO.	CALCULATIONS
B. 90	*OG CDU Fine Error = $\frac{\text{SCA output (Step 89, vdc) - 2.5V R\&D Bias (Step 78)}}{2.00 \times \text{SCA input (Step 89, vac)}} = 1 (\pm 20\%)$
B. 96	*OG 1X Resolver Sin ( $\pm 10^\circ$ ) = $\frac{2 \times [\text{SCA output (Step 94) - 2.5V PCM Bias (Step 22, g)}]}{\text{SCA input (Step 95)}} = 1 (\pm 10\%)$
B. 99	*IG 1X Resolver Sin ( $\pm 10^\circ$ ) = $\frac{2 \times [\text{SCA output (Step 98) - 2.5V PCM Bias (Step 22, g)}]}{\text{SCA input (Step 97)}} = 1 (\pm 10\%)$
B. 102	*MG 1X Resolver Sin ( $\pm 10^\circ$ ) = $\frac{2 \times [\text{SCA output (Step 100) - 2.5V PCM Bias (Step 22, g)}]}{\text{SCA input (Step 101)}} = 1 (\pm 10\%)$
B. 107	IG 1X Resolver Cos ( $45^\circ$ ) = $\frac{8.5 \times [\text{SCA output (Step 106) - 2.5V PCM Bias (Step 22, g)}]}{\text{SCA input (Step 105)}} = 1 (\pm 10\%)$

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JDC ITEM NO.	CALCULATIONS
B. 110	MG 1X Resolver Cos (45°) = 8.5 x [SCA output (Step 108) - 2.5V PCM Bias (Step 22. g)] = 1 (±10%) SCA Input (Step 109)
B. 113	OG 1X Resolver Cos (45°) = 8.5 x [SCA Output (Step 112) - 2.5V PCM Bias (Step 22. g)] = 1 (±10%) SCA Input (Step 111)
B. 116	IG 1X Resolver Sin (45°) = 8.5 x [SCA Output (Step 114) - 2.5V PCM Bias (Step 22. g)] = 1 (±10%) SCA Input (Step 115)
B. 119	MG 1X Resolver Sin (45°) = 8.5 x [SCA Output (Step 118) - 2.5V PCM Bias (Step 22. g)] = 1 (±10%) SCA Input (Step 117)
B. 122	OG 1X Resolver Sin (45°) = 8.5 x [SCA Output (Step 120) - 2.5V PCM Bias (Step 22. g)] = 1 (±10%) SCA Input (Step 121)

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JDC ITEM NO.	CALCULATIONS
B. 126	IG 1X Resolver Cos (135°) = 8.5 x [SCA Output (Step 125, 106) - 2.5V PCM Bias (Step 22. g)] = -1 (±10%) SCA Input (Step 126, 105)
B. 128	MG 1X Resolver Cos (135°) = 8.5 x [SCA Output (Step 127, 108) - 2.5V PCM Bias (Step 22. g)] = -1 (±10%) SCA Input (Step 127, 109)
B. 130	OG 1X Resolver Cos (135°) = 8.5 x [SCA Output (Step 129, 112) - 2.5V PCM Bias (Step 22. g)] = -1 (±10%) SCA Input (Step 129, 111)
B. 132	IG 1X Resolver Sin (135°) = 8.5 x [SCA Output (Step 131, 114) - 2.5V PCM Bias (Step 22. g)] = 1 (±10%) SCA Input (Step 131, 115)
B. 134	MG 1X Resolver Sin (135°) = 8.5 x [SCA Output (Step 133, 118) - 2.5V PCM Bias (Step 22. g)] = 1 (±10%) SCA Input (Step 133, 117)

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JDC ITEM NO.	CALCULATIONS
B. 136	OG 1X Resolver Sin (135°) = 8.5 x [SCA Output (Step 135, 120) - 2.5V PCM Bias (Step 22. g)] = 1 (±10%) SCA Input (Step 135, 121)
B. 140	IG 1X Resolver Cos (225°) = 8.5 x [SCA Output (Step 139, 106) - 2.5V PCM Bias (Step 22. g)] = -1 (±10%) SCA Input (Step 139, 105)
B. 142	MG 1X Resolver Cos (225°) = 8.5 x [SCA Output (Step 141, 108) - 2.5V PCM Bias (Step 22. g)] = -1 (±10%) SCA Input (Step 141, 109)
B. 144	OG 1X Resolver Cos (225°) = 8.5 x [SCA Output (Step 143, 112) - 2.5V PCM Bias (Step 22. g)] = -1 (±10%) SCA Input (Step 143, 111)
B. 146	IG 1X Resolver Sin (225°) = 8.5 x [SCA Output (Step 145, 114) - 2.5V PCM Bias (Step 22. g)] = -1 (±10%) SCA Input (Step 145, 115)

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JDC ITEM NO.	CALCULATIONS
B. 148	MG 1X Resolver Sin (225°) = 8.5 x [SCA Output (Step 147, 118) - 2.5V PCM Bias (Step 22. g)] = -1 (±10%) SCA Input (Step 147, 117)
B. 150	OG 1X Resolver Sin (225°) = 8.5 x [SCA Output (Step 149, 120) - 2.5V PCM Bias (Step 22. g)] = -1 (±10%) SCA Input (Step 149, 121)
B. 154	IG 1X Resolver Cos (315°) = 8.5 x [SCA Output (Step 153, 106) - 2.5V PCM Bias (Step 22. g)] = 1 (±10%) SCA Input (Step 153, 105)
B. 156	MG 1X Resolver Cos (315°) = 8.5 x [SCA Output (Step 155, 108) - 2.5V PCM Bias (Step 22. g)] = 1 (±10%) SCA Input (Step 155, 109)
B. 158	OG 1X Resolver Cos (315°) = 8.5 x [SCA Output (Step 157, 112) - 2.5V PCM Bias (Step 22. g)] = 1 (±10%) SCA Input (Step 157, 111)

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JDC ITEM NO.	CALCULATIONS
B. 160	IG IX Resolver Sin (315°) = $8.5 \times \frac{\text{SCA Output (Step 159, 114)} - 2.5\text{V PCM Bias (Step 22, g)}}{\text{SCA Input (Step 159, 115)}} = -1 (\pm 10\%)$
B. 162	MG IX Resolver Sin (315°) = $8.5 \times \frac{\text{SCA Output (Step 161, 118)} - 2.5\text{V PCM Bias (Step 22, g)}}{\text{SCA Input (Step 161, 117)}} = -1 (\pm 10\%)$
B. 164	OG IX Resolver Sin (315°) = $8.5 \times \frac{\text{SCA Output (Step 163, 120)} - 2.5\text{V PCM Bias (Step 22, g)}}{\text{SCA Input (Step 163, 121)}} = -1 (\pm 10\%)$
B. 199	Yaw Attitude Error = $2.44 \times \frac{\text{SCA Output (Step 198)} - 2.5\text{V PCM Bias (Step 22, g)}}{\text{SCA Input (Step 197)}} = 1 (\pm 10\%)$
B. 202	Pitch Attitude Error = $2.44 \times \frac{\text{SCA Output (Step 201)} - 2.5\text{V PCM Bias (Step 22, g)}}{\text{SCA Input (Step 200)}} = 1 (\pm 10\%)$

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FORM 0118  
Chg. 7-23-65

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REV. K

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JDC ITEM NO.	CALCULATIONS
B. 205	Roll Attitude Error = $2.44 \times \frac{\text{SCA Output (Step 204)} - 2.5\text{V PCM Bias (Step 22, g)}}{\text{SCA Input (Step 203)}} = 1 (\pm 10\%)$

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FORM 0118  
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**SUBSYSTEM** LEM G & N SYSTEM  
**DESCRIPTION** This JDC provides a functional checkout procedure for the Signal Conditioner Assembly. Functional operation is evaluated by checking Signal Conditioner Assembly input and output data for proper correlation. Procedural methods are incorporated to cause signal generation in normally nullified loops where possible in a G and N test configuration for maximum checkout capability.

Rev.	Date	TORR	PAGES REVISED	APPROVAL	REFERENCES
A	8-24-67	34419	ALL	MIT	PS 6015000
B	8-31-67	34473	1,2,4-8,10,11,13,14	EA	JDC 12614
C	10-10-67	34802	12	EA	JDC 18100
D	1-12-68	35421	1,2,4-12,15,16	EA	IMPORTANT See below
E	2-6-68	35561	7,12,13	EA	INTERVAL
F	3-28-68	35977	1-3,5-8,10-13	EA	TOOLS AND MATERIAL
G	7-25-68	36586	1,9,10,12	EA	
H	9-26-68	36861	1	EA	
J	12-2-68	37073	ALL	EA	
K	2-24-69	37363	1,2,5,6,19	EA	
L	5-20-70	38142	1,2,19	EA	

**IMPORTANT:** 1. Insure that connector assembly (2003099) or Restart Monitor module (2898989) is connected to the LGC test connector.

2. Step numbers preceded by an asterisk are not to be performed when testing with LEM Operational SCA, P/N 6007013. Perform all steps when testing with LEM Flight Qualification SCA, P/N 6007010. 3. Refer to JDC 18100 for lubrication instructions prior to engaging any screw or bolt into header helicoil inserts, and for helicoil insert cleaning instructions after all testing has been completed or prior to spacecraft installation.

VERIFICATION WITH SIDL REQUIRED BEFORE USE

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**NOTE:** If VERB display on DSKY contains a number from 11 to 17, KEY REL Indicator may flash when DSKY entries are made.

#### A. PREPARATION

1. Perform, if applicable, JDC 12614 to downmode to OIA on mode.

**NOTE:** If SCA has been previously installed in system configuration prior to performance of this JDC, proceed with step A.7; if installation is required, proceed with step A.2.

2. Remove DSKY Mounting Pedestal

**SUBSYSTEM** LEM G & N SYSTEM  
**DESCRIPTION** POWER ADJUST control on Test Control panel until DVM indicates 28 (±1.0) vdc. Record DVM indication.

9. Insure that PROCEED Indicator of PROCEED/ISS OPERATE pushbutton on Test Control panel is lighted and Standby Requirements of JDC 12614 have been satisfied.

10. Press PROCEED/ISS OPERATE pushbutton. ISS OPERATE Indicator shall light.

**NOTE:** Step 11 applies only when Restart Monitor module is installed.

11. Set contents of Restart Monitor to zero by performing DSKY entries as follows:

a. VERB 21 NOUN 10 ENTR

b. 00077 ENTR

c. 00000 ENTR

d. Press RSET pushbutton.

#### B. PROCEDURE

1. Connect SCA GSE Distribution Box (GDB) stepper switch to DVM by setting CROSSBAR CONTROL switches on Primary Signal Selector panel to 271.

**NOTE:** To position Test Selector panel, perform following operations:

a. Press SIGNAL CONDITIONER LEVEL 1

ENABLE pushbutton if first digit on Test

Selector panel position

is 1, or press SIGNAL

CONDITIONER LEVEL 2

Signal Selector panel to 120 and adjust G&N

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**SUBSYSTEM** LEM G & N SYSTEM  
**DESCRIPTION** ENABLE pushbutton if first digit is 2.

b. Press PUSH TO ADVANCE pushbutton until display indicates last two digits.

2. Set Test Selector panel to 101 to measure and record 28 vdc LGC operate voltage (GG1523X) on DVM.

3. Set Test Selector panel to 102 to measure and record 28 vdc IMU standby voltage (GG1513X) on DVM.

4. Connect following signals to Oscilloscope by setting switches on Oscilloscope Signal Selector panel to positions indicated:

Channel 4 to 1 Z PIPA S/G output (GG2041V)

Channel 5 to 1 Y PIPA S/G output (GG2021V)

Channel 6 to 1 X PIPA S/G output (GG2001V)

Channel 8 to 4 SCA GDB stepper switch

5. Insure that CH4AC, CH5AC, and CH6AC pushbuttons are lighted.

6. Set sensitivities on Oscilloscope Amplifiers for channels 4, 5, and 6 to 500 MV/MM and set sensitivity on channel 8 to 5 V/CM. Use ZERO ADJ control to center all traces.

7. Perform the following DSKY operations:

a. VERB 36 ENTR

b. VERB 41 NOUN 20 ENTR

**Observe:** VERB 21 NOUN 22 Flashing ENTR

c. +00000

**Observe:** VERB 22 NOUN 22 Flashing ENTR

d. -04500

**Observe:** VERB 23 NOUN 22 Flashing ENTR

e. +03500

8. Press CHART SPEEDS 1 pushbutton on Oscilloscope Control panel.

**NOTE:** Perform steps 9 through 12 successively for each Test Selector panel position listed in Table I.

9. Set Test Selector panel to position listed in Table I.

10. Start Oscilloscope by setting CHART DRIVE switch on Oscilloscope Control panel to MM/SEC.

**NOTE:** Ignore all light indications in step 11.

11. Perform the following DSKY operation:

VERB 35 ENTR

Table I

Signal

Test Selector Panel Position

117 Z PIPA G/S in-phase out.

118 Y PIPA G/S in-phase out.

119 X PIPA G/S in-phase out.

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**SUBSYSTEM** LEM G & N SYSTEM  
**DESCRIPTION** 12. Observe channel 8 for indication of PIPA loop opening for approximately 30 seconds then closing. Stop oscilloscope. Record following measurements in these positions, press SIGNAL CONDITIONER LEVEL 2 ENABLE pushbutton and verify that above inhibit indicator extinguishes.

a. VERB 41 NOUN 20 ENTR

**Observe:** VERB 21 NOUN 22 Flashing ENTR

b. +00000

**Observe:** VERB 22 NOUN 22 Flashing ENTR

c. -22500

**Observe:** VERB 23 NOUN 22 Flashing ENTR

d. -03500

14. Repeat steps 9 through 12 then set all Oscilloscope Amplifier sensitivities to OFF.

15. through 19. (Deleted)

20. Set CROSSBAR CONTROL on Primary Signal Selector panel to 173 and adjust G&N POWER ADJUST control on Test Control panel until DVM indicates 28 (±0.25) vdc. Record DVM indication.

21. Set CROSSBAR CONTROL on Primary Signal Selector panel to 271.

22. Set Test Selector panel to positions listed below and measure and record DVM indication for each position:

**NOTE:** SCA TEST TMC INHIBIT Indicator on Temperature Monitor Control

1. 113

106 3200 cps 28 volt supply (GG1331V)

104 2.5 vdc PCM bias (GG1110V)

103 120 vdc ref. (GG1040V)

\*202 IRIG Temperature (GG2301T)

\*145 R&D vdc bias (GG1111V)

\*150 IMU Heater Current (GG2302X)

201 PIPA Temperature (GG2300T)

\*135 Cal Mod Temperature (GG6020T)

Signal

Test Test Selector Panel Position

a. 135

b. \*145

c. \*150

d. 201

e. \*202

f. 103

g. 104

h. 106

i. 113

IG, MG, AND OG SERVO ERRORS

23. Perform following DSKY operations:

a. VERB 36 ENTR

b. VERB 41 NOUN 20 ENTR

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LEM SIGNAL CONDITIONER JOB FUNCTIONAL CHECKOUT			JDC 12620 REV L PAGE 5 OF 19
SUBSYSTEM LEM G & N SYSTEM		ASSY	
c. Observe:	VERB 21 NOUN 22	Flashing	28. Set GIMBAL SERVO TEST switch on Test Selector panel to 1 and set CROSSBAR CONTROL on Primary Signal Selector panel to 135 to monitor IG servo error signal on PAVM. (Input to SCA.)
d. +00000		ENTR	29. Connect decade inductance to PSA TPA test points TB5-32 (high) and TB5-40 (low).
e. Observe:	VERB 22 NOUN 22	Flashing	30. Set Test Selector panel to 137.
f. +00000		ENTR	31. Press to light TEST START pushbutton.
g. Observe:	VERB 23 NOUN 22	Flashing	31A. Set SCOPE "A" INPUT SIGNAL switch on Primary Signal Selector panel to SIG 1 and SCOPE "A" INPUT REFERENCE switch to 3.
h. +00000	NOUN 21	ENTR	31B. Monitor lissajous pattern on Oscilloscope and adjust decade inductance until lissajous pattern indicates minimum phase shift.
i. VERB 21	NOUN 01	ENTR	31C. Measure and record both right and left maximum meter deflection of PAVM. Add the absolute values and record result as maximum meter spread. (SCA input.)
j. 00403		ENTR	31D. Set CROSSBAR CONTROL on Primary Signal Selector panel to 271 and measure and record both high and low voltage indications on DVM. Subtract low voltage from high voltage and record result as maximum meter spread. (SCA output.)
k. 00000		ENTR	32. Press TEST STOP pushbutton on Test Selector panel. TEST START pushbutton shall go out.
l. NOUN 15		ENTR	33. Calculate IG servo error SCA output to IG servo error SCA input as follows.
m. 00000		ENTR	
n. 00000		ENTR	
o. 00000		ENTR	
p. 00000		ENTR	
q. 00000		ENTR	
24. Set switches on Signal Generator as follows:			
a. RANGE to X.01			
b. FREQUENCY meter to 6.0			
c. FUNCTION to SQUARE			
d. DC BALANCE to midposition			
e. AMPLITUDE to 70.			
25. Perform following DSKY operations:			
a. VERB 42		ENTR	
b. VERB 33		ENTR	
26. Set FUNCTION switch on PAVM to 0° and FREQUENCY switch to 3200.			
27. Press to light GIMBAL SERVO TEST pushbutton on Test Selector panel.			

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LEM SIGNAL CONDITIONER JOB FUNCTIONAL CHECKOUT			JDC 12620 REV L PAGE 6 OF 19
SUBSYSTEM LEM G & N SYSTEM		ASSY	
Record result:			MG servo error =
IG servo error =			Step 37, max meter spread
Step 31, max meter spread			Step 35, max meter spread = 0.91 (±15%)
Step 29, max meter spread			39. Set CROSSBAR CONTROL on Primary Signal Selector panel to 133 to monitor OG servo error on PAVM.
34. Set CROSSBAR CONTROL on Primary Signal Selector panel to 134 to monitor MG servo error on PAVM.			40. Connect decade inductance to PSA TPA test points TB5-31 (high) and TB5-40 (low).
35. Connect decade inductance to PSA TPA test points TB5-41 (high) and TB5-40 (low).			41. Set GIMBAL SERVO TEST switch on Test Selector panel to 3.
36. Set GIMBAL SERVO TEST switch on Test Selector panel to 2.			42. Set Test Selector panel to 138.
37. Set Test Selector panel to 138.			42A. Press to light TEST START pushbutton.
37A. Press to light TEST START pushbutton.			42B. Monitor lissajous pattern on Oscilloscope and adjust decade inductance until lissajous pattern indicates minimum phase shift.
37B. Monitor lissajous pattern on Oscilloscope and adjust decade inductance until lissajous pattern indicates minimum phase shift.			37C. Measure and record both right and left maximum meter deflection of PAVM. Add the absolute values and record result as maximum meter spread. (SCA input.)
37C. Measure and record both right and left maximum meter deflection of PAVM. Add the absolute values and record result as maximum meter spread. (SCA input.)			37D. Set CROSSBAR CONTROL on Primary Signal Selector panel to 271 and measure and record both high and low voltage indications on DVM. Subtract low voltage from high voltage and record result as maximum meter spread. (SCA output.)
37D. Set CROSSBAR CONTROL on Primary Signal Selector panel to 271 and measure and record both high and low voltage indications on DVM. Subtract low voltage from high voltage and record result as maximum meter spread. (SCA output.)			37E. Press TEST STOP pushbutton on Test Selector panel. TEST START pushbutton shall go out.
37E. Press TEST STOP pushbutton on Test Selector panel. TEST START pushbutton shall go out.			38. Calculate MG servo error SCA output to MG servo error SCA input as follows.
38. Calculate MG servo error SCA output to MG servo error SCA input as follows.			Record result.

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LEM SIGNAL CONDITIONER JOB FUNCTIONAL CHECKOUT			JDC 12620 REV L PAGE 7 OF 19
SUBSYSTEM LEM G & N SYSTEM		ASSY	
43. Calculate OG servo error SCA output to OG servo error SCA input as follows:			*53. Press to light GIMBAL SERVO TEST pushbutton on Test Selector panel.
Record result.			*54. Connect PSA TPA direct probes to TB2-31 (high) and TB1-49 (low) to monitor IG torque motor current on channel 6. (Input to SCA.)
OG servo error =			*55. Set Test Selector panel to 132 and GIMBAL SERVO TEST switch to 1 to monitor IG torque motor current on channel 8. (Output of SCA.)
Step 42, max meter spread = 0.91 (±15%)			*56. Press to light TEST START pushbutton.
Step 40, max meter spread			*57. Increase Signal Generator AMPLITUDE control until Oscilloscope indicates 2 volts peak-to-peak. Maintain Signal Generator AMPLITUDE control setting for approximately 10 seconds, then set AMPLITUDE control to 0.
44. Press to extinguish GIMBAL SERVO TEST pushbutton on Test Selector panel.			*58. Press TEST STOP pushbutton on Test Selector panel. TEST START pushbutton shall go out.
*IG, MG, AND OG TORQUE MOTOR CURRENTS (GG2110C, GG2140C, AND GG2170C)			*59. Set CHART DRIVE switch on Oscilloscope and record peak-to-peak SCA input signal monitored on channel 6 and peak-to-peak SCA output signal monitored on channel 8.
*45. Insure that AMPLITUDE control on Signal Generator is set to 0.			*60. Set CHART DRIVE switch on Oscilloscope Control panel to MM/SEC.
*46. Connect jumper between PROBES OUTPUT DIRECT jacks and CH6DC IN jacks on Auxiliary Input panel.			*61. Connect PSA TPA direct probes to TB2-32 (high) and TB1-49 (low) to monitor MG torque motor current on channel 6. (Input to SCA.)
*47. Set OSCILLOGRAPH SELECTOR CHANNEL 6 switch on Oscillograph Signal Selector panel to 15.			*62. Press to light TEST START pushbutton.
*48. Insure that CH6DC Indicator is lighted.			
*49. Zero Oscillograph channel 6 and set sensitivity to 0.2 V/CM. Set sensitivity of channel 8 to 2 V/CM and zero adjust channel 8 for a centered trace with a 2.5 vdc bias input by off-setting zero line 12.5 mm to right of chart center line.			
*50. Set FREQUENCY meter on Signal Generator to 5 and RANGE switch to X10.			
*51. Set CHART DRIVE switch on Oscilloscope Control panel to MM/SEC.			
*52. Set CROSSBAR CONTROL on Primary Signal Selector panel to 176 to monitor Signal Generator output on Oscilloscope.			

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LEM SIGNAL CONDITIONER JOB FUNCTIONAL CHECKOUT			JDC 12620 REV L PAGE 8 OF 19
SUBSYSTEM LEM G & N SYSTEM		ASSY	
*63. Increase Signal Generator AMPLITUDE control until Oscilloscope indicates 1 volt peak-to-peak. Maintain Signal Generator AMPLITUDE control setting for approximately 10 seconds, then set AMPLITUDE control to 0.			record peak-to-peak SCA input signal monitored on channel 6 and peak-to-peak SCA output signal monitored on channel 8.
*64. Press TEST STOP pushbutton on Test Selector panel. TEST START pushbutton shall go out.			*IG, MG, AND OG CDU FINE ERRORS (GG2220, GG2250, AND GG2280)
*65. Set CHART DRIVE switch on Oscilloscope Control panel to CM/HR. Measure and record peak-to-peak SCA input signal monitored on channel 6 and peak-to-peak SCA output signal monitored on channel 8.			*72. Perform following DSKY operations:
*66. Set CHART DRIVE switch on Oscilloscope Control panel to MM/SEC.			a. VERB 41 NOUN 20 ENTR
*67. Connect PSA TPA direct probes to TB1-45 (high) and TB1-49 (low) to monitor OG torque motor current on channel 6. (Input to SCA.)			b. Observe:
*68. Press to light TEST START pushbutton.			VERB 21 NOUN 22 Flashing
*69. Increase Signal Generator AMPLITUDE control until Oscilloscope indicates 1 volt peak-to-peak. Maintain Signal Generator AMPLITUDE control setting for approximately 10 seconds, then set AMPLITUDE control to 0.			c. +00000
*70. Press TEST STOP pushbutton on Test Selector panel. TEST START pushbutton shall go out.			d. Observe:
*71. Set CHART DRIVE switch on Oscilloscope Control panel to CM/HR. Measure and			VERB 22 NOUN 22 Flashing
			e. +00000
			f. Observe:
			VERB 23 NOUN 22 Flashing
			g. +00000
			*73. Connect jumper between PROBES OUTPUT BUFFERED jacks and PAVM IN jacks on Auxiliary Input panel.
			*74. Perform following DSKY operations:
			a. VERB 21 NOUN 01 ENTR
			b. 00370
			c. 16002
			d. VERB 57
			e. 00003
			f. Observe:
			VERB 06 NOUN 61 Flashing
			g. VERB 21
			h. +00000
			i. VERB 22
			j. Site Latitude
			(from Table II)
			k. VERB 33

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## LEM SIGNAL CONDITIONER

JOB FUNCTIONAL CHECKOUT

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SUBSYSTEM LEM G & N SYSTEM			ASSY
1. 00004	ENTR		*79. Connect PSA TPA buffered probes to TB3-37 (high) and TB3-34 (low) to monitor IG CDU fine error signal on PAVM. (Input to SCA.)
m. 00001	ENTR		
n. Observe:	VERB 21	NOUN 22	Flashing
o. +00100			ENTR
p. Observe:	VERB 22	NOUN 22	Flashing
q. +00100			ENTR
r. Observe:	VERB 23	NOUN 22	Flashing
s. +00100			ENTR
Table II			
Test Site	Latitude		
MIT	+42.366		
AC	+42.902		
GAEC	+40.748		
MSC	+29.556		
KSC	+28.524		
NAA	+33.921		
*75. Within 10 to 90 seconds after performance of step 74, s, perform following DSKY operations:			
a. VERB 21	NOUN 01	ENTR	
b. 02512		ENTR	
c. 00000		ENTR	
d. VERB 16	NOUN 20	ENTR	
*76. Record DSKY Row 1, Row 2, and Row 3 indications.			
*77. Approximately 120 seconds after performance of step 76, record DSKY Row 1, Row 2, and Row 3 indications.			
*78. Set Test Selector panel to 145 and CROSSBAR CONTROL on Primary Signal Selector panel to 271. Record R&D 2.5 vdc bias voltage indicated on DVM.			

*79. Connect PSA TPA buffered probes to TB3-37 (high) and TB3-34 (low) to monitor IG CDU fine error signal on PAVM. (Input to SCA.)
*80. Set Test Selector panel to 140 to monitor IG CDU fine error signal on DVM. (Output of SCA.)
NOTE: Due to earth rate, voltages measured in step 81 will vary.
*81. Simultaneously measure and record SCA in-phase input voltage on PAVM and SCA output voltage on DVM.
*82. Calculate SCA output IG CDU fine error to SCA input IG CDU fine error as follows. Record result: IG CDU fine error = Step 81 (vdc) - Step 78 = 1 (±20%) 2.00 x Step 81 (vdc)
*83. Connect PSA TPA buffered probes to TB3-38 (high) and TB3-34 (low) to monitor MG CDU fine error signal on PAVM. (Input to SCA.)
*84. Set Test Selector panel to 141 to monitor MG CDU fine error signal on DVM. (Output of SCA.)
NOTE: Due to earth rate, voltages measured in step 85 will vary.
*85. Simultaneously measure and record SCA in-phase input voltage on PAVM and SCA output voltage on DVM.

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## LEM SIGNAL CONDITIONER

JOB FUNCTIONAL CHECKOUT

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SUBSYSTEM LEM G & N SYSTEM			ASSY
*86. Calculate SCA output MG CDU fine error to SCA input MG CDU fine error as follows. Record result:			b. Observe: VERB 21 NOUN 22 Flashing ENTR
MG CDU fine error =			c. +01000
Step 85 (vdc) - Step 78			d. Observe: VERB 22 NOUN 22 Flashing ENTR
2.00 x Step 85 (vac)			e. +01000
*87. Connect PSA TPA buffered probes to TB3-41 (high) and TB3-34 (low) to monitor OG CDU fine error signal on PAVM. (Input to SCA.)			f. Observe: VERB 23 NOUN 22 Flashing ENTR
*88. Set Test Selector panel to 142 to monitor OG CDU fine error signal on DVM. (Output of SCA.)			g. +01000
NOTE: Due to earth rate, voltages measured in step 89 will vary.			
*89. Simultaneously measure and record SCA in-phase input voltage on PAVM and SCA output voltage on DVM.			
*90. Calculate SCA output OG CDU fine error to SCA input OG CDU fine error as follows. Record result:			
OG CDU fine error =			
Step 89 (vdc) - Step 78 = 1 (±30%)			
2.00 x Step 89 (vac)			
*91. Perform following DSKY operations:			Step 95
a. VERB 21	NOUN 01	ENTR	
b. 02512		ENTR	
c. 77776		ENTR	
*92. MG, AND OG 1X RESOLVER SIN ±10 DEGREES (GG2121, GG2151, AND GG 2181)			
*92. Perform following DSKY operations:			
a. VERB 41	NOUN 20	ENTR	

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## LEM SIGNAL CONDITIONER

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SUBSYSTEM LEM G & N SYSTEM			ASSY
*99. Calculate SCA output IG 1X resolver sin to SCA input IG 1X resolver sin as follows. Record results:			
IG 1X resolver sin (45°) =			
2 (Step 98 - Step 22. g) = 1 (±10%)			
Step 97			
*100. Set Test Selector panel to 205 and measure and record MG 1X resolver sin voltage indicated on DVM. (Output of SCA.)			
*101. Set CROSSBAR CONTROL on Primary Signal Selector panel to 143 and measure and record MG 1X resolver sin voltage indicated on DVM. (Input to SCA.)			
*102. Calculate SCA output MG 1X resolver sin to SCA input MG 1X resolver sin as follows. Record results:			
MG 1X resolver sin (45°) =			
2 (Step 100 - Step 22. g) = 1 (±10%)			
Step 101			
IG, MG, AND OG 1X RESOLVER SIN AND COS			
103. Perform following DSKY operations:			
a. VERB 41	NOUN 20	ENTR	
b. Observe:			
VERB 21	NOUN 22	Flashing ENTR	
c. +04500			
d. Observe:			
VERB 22	NOUN 22	Flashing ENTR	
e. +04500			
f. Observe:			
VERB 23	NOUN 22	Flashing ENTR	
g. +04500			
h. VERB 16	NOUN 20	ENTR	
104. Record DSKY Row 1, Row 2, and Row 3 indications.			

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SUBSYSTEM LEM G & N SYSTEM			ASSY
Selector panel to 122. Measure and record OG 1X resolver cos voltage indicated on DVM. (Output of SCA.)			
113. Calculate SCA output OG 1X resolver cos to SCA input OG 1X resolver cos as follows. Record result:			
OG 1X resolver cos (45°) =			
8.5 (Step 112 - Step 22. g) = 1 (±10%)			
Step 111			
114. Set Test Selector panel to 123 and measure and record IG 1X resolver sin voltage indicated on DVM. (Output of SCA.)			
115. Set CROSSBAR CONTROL on Primary Signal Selector panel to 144 and measure and record IG 1X resolver sin voltage indicated on DVM. (Input to SCA.)			
116. Calculate SCA output IG 1X resolver sin to SCA input IG 1X resolver sin as follows. Record result:			
IG 1X resolver sin (45°) =			
8.5 (Step 114 - Step 22. g) = 1 (±10%)			
Step 115			
117. Set CROSSBAR CONTROL on Primary Signal Selector panel to 143 and measure and record MG 1X resolver sin voltage indicated on DVM. (Input to SCA.)			
118. Set CROSSBAR CONTROL on Primary Signal Selector panel to 271 and set Test Selector panel to 124. Measure and record MG 1X resolver sin voltage indicated on DVM. (Output of SCA.)			
119. Calculate SCA output MG 1X resolver sin to SCA input MG 1X resolver sin as follows. Record result:			
MG 1X resolver sin (45°) =			
8.5 (Step 117 - Step 22. g) = 1 (±10%)			
Step 121			
123. Perform following DSKY operations:			
a. VERB 41	NOUN 20	ENTR	
b. Observe:			
VERB 21	NOUN 22	Flashing ENTR	
c. +13500			
d. Observe:			
VERB 22	NOUN 22	Flashing ENTR	
e. +13500			
f. Observe:			
VERB 23	NOUN 22	Flashing ENTR	
g. +13500			
h. Observe:			
GIMBAL LOCK			
1. VERB 16	NOUN 20	ENTR	
124. Record DSKY Row 1, Row 2, and Row 3 indications.			
125. Repeat steps 105 and 106.			

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JOB FUNCTIONAL CHECKOUT

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SUBSYSTEM LEM G & N SYSTEM	ASSY
126. Calculate SCA output IG 1X resolver cos to SCA input IG 1X resolver cos as follows. Record result: IG 1X resolver cos (135°) = 8.5 [Step 125 (106) - Step 22.g] = -1 (±10%) Step 125 (105)	135. Repeat steps 120 and 121. 136. Calculate SCA output OG 1X resolver sin to SCA input OG 1X resolver sin as follows. Record result: OG 1X resolver sin (135°) = 8.5 [Step 135 (120) - Step 22.g] = 1 (±10%) Step 135 (121)
127. Repeat steps 108 and 109. 128. Calculate SCA output MG 1X resolver cos to SCA input MG 1X resolver cos as follows. Record result: MG 1X resolver cos (135°) = 8.5 [Step 127 (108) - Step 22.g] = -1 (±10%) Step 127 (109)	137. Perform following DSKY operations: a. VERB 41 NOUN 20 ENTR b. Observe: VERB 21 NOUN 22 Flashing ENTR c. +22500 d. Observe: VERB 22 NOUN 22 Flashing ENTR e. +22500 f. Observe: VERB 23 NOUN 22 Flashing ENTR g. +22500 h. VERB 16 NOUN 20 ENTR 138. Record DSKY Row 1, Row 2, and Row 3 indications. 139. Repeat steps 105 and 106. 140. Calculate SCA output IG 1X resolver cos to SCA input IG 1X resolver cos as follows. Record result: IG 1X resolver sin (135°) = 8.5 [Step 131 (114) - Step 22.g] = 1 (±10%) Step 131 (115)
129. Repeat steps 111 and 112. 130. Calculate SCA output OG 1X resolver cos to SCA input OG 1X resolver cos as follows. Record result: OG 1X resolver cos (135°) = 8.5 [Step 129 (112) - Step 22.g] = -1 (±10%) Step 129 (111)	141. Repeat steps 108 and 109. 142. Calculate SCA output MG 1X resolver cos to SCA input MG 1X resolver cos as follows. Record result: MG 1X resolver sin (135°) = 8.5 [Step 141 (108) - Step 22.g] = -1 (±10%) Step 141 (109)
131. Repeat steps 114 and 115. 132. Calculate SCA output IG 1X resolver sin to SCA input IG 1X resolver sin as follows. Record result: IG 1X resolver sin (135°) = 8.5 [Step 131 (114) - Step 22.g] = 1 (±10%) Step 131 (115)	143. Repeat steps 117 and 118. 144. Calculate SCA output OG 1X resolver cos to SCA input OG 1X resolver cos as follows. Record result: OG 1X resolver cos (135°) = 8.5 [Step 133 (118) - Step 22.g] = 1 (±10%) Step 133 (117)

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SUBSYSTEM LEM G & N SYSTEM	ASSY
143. Repeat steps 111 and 112. 144. Calculate SCA output OG 1X resolver cos to SCA input OG 1X resolver cos as follows. Record result: OG 1X resolver cos (225°) = 8.5 [Step 143 (112) - Step 22.g] = -1 (±10%) Step 143 (111)	d. Observe: VERB 22 NOUN 22 Flashing ENTR e. +31500 f. Observe: VERB 23 NOUN 22 Flashing ENTR g. +31500 h. VERB 16 NOUN 20 ENTR 152. Record DSKY Row 1, Row 2, and Row 3 indications. 153. Repeat steps 105 and 106. 154. Calculate SCA output IG 1X resolver cos to SCA input IG 1X resolver cos as follows. Record result: IG 1X resolver cos (315°) = 8.5 [Step 153 (106) - Step 22.g] = 1 (±10%) Step 153 (105)
145. Repeat steps 114 and 115. 146. Calculate SCA output IG 1X resolver sin to SCA input IG 1X resolver sin as follows. Record result: IG 1X resolver sin (225°) = 8.5 [Step 145 (114) - Step 22.g] = -1 (±10%) Step 145 (115)	155. Repeat steps 108 and 109. 156. Calculate SCA output MG 1X resolver cos to SCA input MG 1X resolver cos as follows. Record result: MG 1X resolver cos (315°) = 8.5 [Step 155 (108) - Step 22.g] = 1 (±10%) Step 155 (109)
147. Repeat steps 117 and 118. 148. Calculate SCA output MG 1X resolver sin to SCA input MG 1X resolver sin as follows. Record result: MG 1X resolver sin (225°) = 8.5 [Step 147 (118) - Step 22.g] = -1 (±10%) Step 147 (117)	157. Repeat steps 111 and 112. 158. Calculate SCA output OG 1X resolver cos to SCA input OG 1X resolver cos as follows. Record result: OG 1X resolver cos (315°) = 8.5 [Step 157 (112) - Step 22.g] = 1 (±10%) Step 157 (111)
149. Repeat steps 120 and 121. 150. Calculate SCA output OG 1X resolver sin to SCA input OG 1X resolver sin as follows. Record result: OG 1X resolver sin (225°) = 8.5 [Step 149 (120) - Step 22.g] = -1 (±10%) Step 149 (121)	159. Repeat steps 114 and 115. 160. Calculate SCA output IG 1X resolver sin to SCA input IG 1X resolver sin as follows. Record result: OG 1X resolver sin (225°) = 8.5 [Step 159 (114) - Step 22.g] = -1 (±10%) Step 159 (113)

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SUBSYSTEM LEM G & N SYSTEM	ASSY
161. Repeat steps 117 and 118. 162. Calculate SCA output MG 1X resolver sin to SCA input MG 1X resolver sin as follows. Record result: MG 1X resolver sin (315°) = 8.5 [Step 161 (118) - Step 22.g] = -1 (±10%) Step 161 (117)	b. Connect cable W172 to GSE distribution box (GDB). c. Connect RCT power cable to facility 115 vac power. d. Connect jumper from DEB panel OUTPUT jacks to SIGNAL INPUT jacks. e. Set 800~REFERENCE INPUT VOLTAGE switch to 26V. POWER indicator shall light. f. Press POWER ON pushbutton on RCT Control panel. POWER ON, READ MODE, and MON COARSE or MON FINE indicators shall light. g. Insure that one of the three operating channel indicators (IG, MG, or OG SELECT) is lighted. Insure that READ RATE TABLE INPUT and LORS RATE TABLE CONTROL indicators are not lighted.
163. Repeat steps 120 and 121. 164. Calculate SCA output OG 1X resolver sin to SCA input OG 1X resolver sin as follows. Record result: OG 1X resolver sin (315°) = 8.5 [Step 163 (120) - Step 22.g] = -1 (±10%) Step 163 (121)	h. Press READ MODE/SET MODE pushbutton to light SET MODE indicator. i. Insure that MON COARSE indicator is lighted. j. Set REFERENCE QUADRANT VERNIER control to 0° and REFERENCE QUADRANT switch to 0°-90°. k. Set DEGREES dials to 0-00.000. l. Rotate RESOLVER ANGLE TRANSMITTER control CW until null meter deflects right (+). m. Press MON COARSE/MON FINE pushbutton. MON FINE indicator shall light. n. Rotate RESOLVER ANGLE TRANSMITTER control CW until null meter deflects right (+).
165. Perform following DSKY operations: a. VERB 41 NOUN 20 ENTR b. Observe: VERB 21 NOUN 22 Flashing ENTR c. +00000 d. Observe: VERB 22 NOUN 22 Flashing ENTR e. +00000 f. Observe: VERB 23 NOUN 22 Flashing ENTR g. +00000 166. Prepare Resolver Circuit Tester (RCT) as follows: a. Set Decade Error Bridge (DEB) panel switches and controls to OFF, minimum, or zero.	*171. Perform following DSKY operations: a. VERB 40 NOUN 40 ENTR b. VERB 21 NOUN 10 ENTR c. 00012 ENTR d. 00011 ENTR *172. Monitor SCA input on PAVM by connecting PSA TPA buffered probe to TB3-33 (high) and TB3-34 (low) and connecting jumper between PROBES OUTPUT BUFFERED jacks and PAVM IN jacks on Auxiliary Input panel. Set VOLTMETER INPUT PAVM switch on Primary Signal Selector panel to AUX. *173. Adjust RESOLVER ANGLE TRANSMITTER control to produce a minimum total voltage on PAVM. Record DVM indication. *174. Adjust RESOLVER ANGLE TRANSMITTER control until in-phase voltage on PAVM is +720 mv. Record DVM indication. *175. Press TRUN SELECT/SET ENABLE pushbutton. Both halves of pushbutton shall light. *176. Connect trunion CDU fine error output from SCA to DVM by setting Test Selector panel to 147. *177. Remove PSA TPA buffered probe from TB3-33 (high) and connect to TB3-30 (high). *178. Adjust RESOLVER ANGLE TRANSMITTER control until in-phase voltage on PAVM is +720 mv. Record DVM indication. *179. Adjust RESOLVER ANGLE TRANSMITTER control until PAVM indicates minimum total voltage. Record DVM indication.

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SUBSYSTEM LEM G & N SYSTEM	ASSY
167. Set RESOLVER ANGLE TRANSMITTER control to 0. *168. Press READ MODE/SET MODE pushbutton to light SET MODE indicator. *169. Press SHAFT SELECT/SET ENABLE pushbutton. Both halves of pushbutton shall light. *170. Connect shaft CDU fine error output from SCA to DVM by setting Test Selector panel to 146. Insure that CROSSBAR CONTROL on Primary Signal Selector panel is set to 271. NOTE: G/N CAUTION lamp on Monitor panel and PROG lamp on DSKY will light during performance of steps 171 through 179. Ignore lamp indications.	*171. Perform following DSKY operations: a. VERB 40 NOUN 40 ENTR b. VERB 21 NOUN 10 ENTR c. 00012 ENTR d. 00011 ENTR *172. Monitor SCA input on PAVM by connecting PSA TPA buffered probe to TB3-33 (high) and TB3-34 (low) and connecting jumper between PROBES OUTPUT BUFFERED jacks and PAVM IN jacks on Auxiliary Input panel. Set VOLTMETER INPUT PAVM switch on Primary Signal Selector panel to AUX. *173. Adjust RESOLVER ANGLE TRANSMITTER control to produce a minimum total voltage on PAVM. Record DVM indication. *174. Adjust RESOLVER ANGLE TRANSMITTER control until in-phase voltage on PAVM is +720 mv. Record DVM indication. *175. Press TRUN SELECT/SET ENABLE pushbutton. Both halves of pushbutton shall light. *176. Connect trunion CDU fine error output from SCA to DVM by setting Test Selector panel to 147. *177. Remove PSA TPA buffered probe from TB3-33 (high) and connect to TB3-30 (high). *178. Adjust RESOLVER ANGLE TRANSMITTER control until in-phase voltage on PAVM is +720 mv. Record DVM indication. *179. Adjust RESOLVER ANGLE TRANSMITTER control until PAVM indicates minimum total voltage. Record DVM indication.

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## LEM SIGNAL CONDITIONER

JOB FUNCTIONAL CHECKOUT

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## SUBSYSTEM LEM G &amp; N SYSTEM

ASSY

- \*180. Perform following DSKY operations:
- a. VERB 21 NOUN 10 ENTR
- b. 00012 ENTR
- c. 00010 ENTR

## RR SHAFT AND TRUNNION 1X RESOLVER

## SIN AND COS

NOTE: G/N CAUTION

lamp on Monitor panel  
and PROG lamp on DSKY  
will light during perform-  
ance of steps 181 through  
194.

181. Perform following DSKY operations:

- a. VERB 36 ENTR
- b. VERB 40 NOUN 40 ENTR

182. Set following switches on DEB and RCT Control panels:

- a. DEB - REFERENCE QUADRANT to 0°-90°.

- b. DEB - SENSITIVITY fully CCW.

- c. RCT - Insure that one of the three operating channel indicators (IG, MG, or OG SELECT) is lighted. Insure that READ RATE TABLE INPUT and LORS RATE TABLE CONTROL indicators are not lighted.

- d. RCT - SET MODE lighted.

- e. DEB - DEGREES to 0°-45.000.

- f. RCT - MON COARSE lighted.

- g. RCT - RESOLVER ANGLE TRANS-  
MITTER to 45.000.

- h. DEB/RCT - Rotate RESOLVER ANGLE TRANSMITTER control and SENSITIV-  
ITY COARSE control to null meter.

- i. DEB - SENSITIVITY fully CCW.  
j. RCT - MON FINE lighted.  
k. DEB - DEGREES to 0°-00.000.  
l. DEB/RCT - Rotate RESOLVER ANGLE TRANSMITTER control and SENSITIV-  
ITY COARSE and FINE controls to null meter.

- m. DEB - SENSITIVITY fully CCW.

- n. RCT - Insure that IG, MG, and OG SELECT are not lighted.

183. Press TRUN SELECT/SET ENABLE pushbutton on RCT Control panel. Both halves of pushbutton shall light.

184. Enter VERB 06 NOUN 40 into DSKY and press ENTR pushbutton. Verify that DSKY Row 1 indicates approximately 04500 and Row 2 indicates approximately 00000.

185. Insure that CROSSBAR CONTROL on Primary Signal Selector panel is set to 271.

186. Set Test Selector panel to 128. Measure and record trunnion 1X resolver sin voltage output from SCA on DVM.

187. Set Test Selector panel to 131. Measure and record trunnion 1X resolver cos voltage output from SCA on DVM.

188. Press SHAFT SELECT/SET ENABLE pushbutton on RCT Control panel. Both halves of pushbutton shall light.

189. Enter VERB 06 NOUN 40 into DSKY and press ENTR pushbutton. Verify that DSKY Row 1 indicates approximately 00000 and Row 2 indicates approximately 04500.

190. Set Test Selector panel to 129. Measure and record shaft 1X resolver sin voltage output from SCA on DVM.

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## LEM SIGNAL CONDITIONER

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## SUBSYSTEM LEM G &amp; N SYSTEM

ASSY

191. Set Test Selector panel to 130. Measure and record shaft 1X resolver cos voltage output from SCA on DVM.

192. Set RESOLVER ANGLE TRANSMIT-  
TER control to 0.

193. Set 800~ REFERENCE INPUT VOLT-  
AGE switch on DEB to OFF.

- YAW, PITCH, AND ROLL ATTITUDE

## ERRORS

194. Perform following DSKY operations:

- a. VERB 36 ENTR

- b. VERB 41 NOUN 20 ENTR

- c. Observe: NOUN 22 Flashing

- d. +00000 ENTR

- e. Observe: NOUN 22 Flashing

- f. +00000 ENTR

- g. Observe: NOUN 22 Flashing

- h. +00000 ENTR

NOTE: ISS WARNING lamp

on Monitor panel may light

during performance of step

195. Ignore lamp indication.

195. Perform following DSKY operations:

- a. VERB 21 NOUN 10 ENTR

- b. 00012 ENTR

- c. 00060 ENTR

- d. VERB 43 ENTR

- e. Observe: NOUN 22 Flashing

- f. +01600 ENTR

- g. Observe: NOUN 22 Flashing

- h. +01600 ENTR

- i. Observe: NOUN 22 Flashing

- j. +01600 ENTR

196. Connect jumper between PROBES OUT-  
PUT DIRECT jacks and PAVM IN jacks on Auxiliary Input panel. Set VOLTMETER INPUT PAVM switch on Primary Signal Selector panel to AUX.

197. Connect PSA TPA direct probes to TB4-43 (high) and TB4-47 (low) and measure and record yaw attitude error total voltage indicated on PAVM. (Input to SCA.)

198. Set Test Selector panel to 114 and measure and record yaw attitude error volt-  
age indicated on DVM. (Output of SCA.)

199. Calculate SCA output yaw attitude error to SCA input yaw attitude error as follows. Record result:

Yaw attitude error =

2.44 (Step 198 - Step 22. g) = 1 (±10%)

Step 197

200. Connect PSA TPA direct probes to TB4-45 (high) and TB4-49 (low) and measure and record pitch attitude error total voltage indicated on PAVM. (Input to SCA.)

201. Set Test Selector panel to 115 and measure and record pitch attitude error voltage indicated on DVM. (Output of SCA.)

202. Calculate SCA output pitch attitude error to SCA input pitch attitude error as

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## SUBSYSTEM LEM G &amp; N SYSTEM

ASSY

follows. Record result:

Pitch attitude error =

2.44 (Step 201 - Step 22. g) = 1 (±10%)

Step 200

203. Connect PSA TPA direct probes to TB4-44 (high) and TB4-48 (low) and measure and record roll attitude error total voltage indicated on PAVM. (Input to SCA.)

204. Set Test Selector panel to 116 and measure and record roll attitude error voltage indicated on DVM. (Output of SCA.)

205. Calculate SCA output roll attitude error to SCA input roll attitude error as follows. Record result:

Roll attitude error =

2.44 (Step 204 - Step 22. g) = 1 (±10%)

Step 203

206. Perform following DSKY operations:

- a. VERB 36 ENTR

- b. VERB 41 NOUN 20 ENTR

- c. Observe: NOUN 22 Flashing

- d. +00000 ENTR

- e. Observe: NOUN 22 Flashing

- f. +00000 ENTR

- g. Observe: NOUN 22 Flashing

- h. +00000 ENTR

207. Press POWER ON pushbutton on RCT Control panel. The pushbutton shall extinguish.

208. Disconnect cable W172 from GDB.

NOTE: Step 208A applies only

when Restart Monitor module

(2898989) is installed.

- 208A. Perform the following DSKY operations:

- a. VERB 01 NOUN 10 ENTR

- b. 00077 ENTR

- c. The contents of Row 1 shall be 00000.

209. If additional G & N System testing is to be performed, down mode the G & N System to OJA ON mode in accordance with JDC 12614 and remove cable W157 from SCM breakout box and from cable W142. Reconnect cable W142 to SCM breakout box.

APOLLO G&N  
EQUIPMENT TEST  
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JOB LEM SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

NO. 12620-JDC  
REV L  
INITIAL TDRR 32757

ASSEMBLY UNDER TEST				TEST HISTORY			
TITLE		DATE		END		SITE / LOCATION	
SER. NO.		DWG		REV.		TOTAL ELAPSED	
MAJOR GROUND SUPPORT EQUIPMENT							
CONDUCTED BY: NAME/AFFILIATION APPROVED BY: NAME/AFFILIATION							
NAME SER. NO. CAL DATE							
NAME SER. NO. CAL DATE							
JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
A. 8	Bus voltage	vdc	27.00		29.00		
B. 2	28 vdc LGC operate	vdc	3.9		4.8		
B. 3	28 vdc IMU standby	vdc	3.9		4.8		
B. 12	Loop closure (channel 8 to 4)						
	Loop closure (channel 8 to 5)						
	Loop closure (channel 8 to 6)						
B. 14 (B. 12)	Loop closure (channel 8 to 4)						
	Loop closure (channel 8 to 5)						
	Loop closure (channel 8 to 6)						
B. 20	Bus voltage	vdc	27.75		28.25		
B. 22. a	*Cal Mod Temp	vdc	0.40		1.26		
B. 22. b	*R&D 2.5 vdc bias	vdc	2.47		2.53		

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EQUIPMENT TEST  
DATA SHEET 2 OF 19

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JOB LEM SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ ACC
B. 22. c	*IMU heater current	vdc	3. 9		4. 8	
B. 22. d	PIPA Temp	vdc	2. 0		3. 0	
B. 22. e	*IRIG Temp	vdc	2. 37		3. 70	
B. 22. f	120 vdc reference	vdc	2. 80		4. 20	
B. 22. g	2. 5 vdc PCM bias	vdc	2. 47		2. 53	
B. 22. h	3200 cps, 28v supply	vdc	4. 20		4. 80	
B. 22. i	800 cps, 28v supply	vdc	4. 20		4. 80	
B. 31C	Maximum right	vac				
	Maximum left	vac				
	Maximum meter spread (IG servo error, SCA input)	vac				
B. 31D	Maximum high	vdc				
	Maximum low	vdc				
	Maximum meter spread (IG servo error, SCA output)	vdc				
B. 33	IG servo error		0. 77		1. 05	
B. 37C	Maximum right	vac				
	Maximum left	vac				
	Maximum meter spread (MG servo error, SCA input)	vac				

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DATA SHEET 3 OF 19

JDC  
NO. 12620  
REV. L

JOB LEM SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ ACC
B. 37D	Maximum high	vdc				
	Maximum low	vdc				
	Maximum meter spread (MG servo error, SCA output)	vdc				
B. 38	MG servo error		0. 77		1. 05	
B. 42C	Maximum right	vac				
	Maximum left	vac				
	Maximum meter spread (OG servo error, SCA input)	vac				
B. 42D	Maximum high	vdc				
	Maximum low	vdc				
	Maximum meter spread (OG servo error, SCA output)	vdc				
B. 43	OG servo error		0. 77		1. 05	
B. 59	*IG TMC (Channel 6)	v p-p				
	*IG TMC (Channel 8)	v p-p	Channel 6 x 5. 0 -15%		Channel 6 x 5. 0 +15%	
B. 65	*MG TMC (Channel 6)	v p-p				
	*MG TMC (Channel 8)	v p-p	Channel 6 x 5. 0 -15%		Channel 6 x 5. 0 +15%	

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NO. 12620  
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JOB LEM SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ ACC
B. 71	*OG TMC (Channel 6)	v p-p				
	*OG TMC. (Channel 8)	v p-p	Channel 6 x 2. 75 -15%		Channel 6 x 2. 75 +15%	
B. 76	*Row 1	deg				
	*Row 2	deg				
	*Row 3	deg				
B. 77	*Row 1	deg				
	*Row 2	deg				
	*Row 3	deg				
B. 78	*R&D 2. 5 vdc bias	vdc				
B. 81	*IG CDU fine error (PAVM)	vac				
	*IG CDU fine error (DVM)	vdc				
B. 82	*IG CDU fine error		0. 80		1. 20	
B. 85	*MG CDU fine error (PAVM)	vac				
	*MG CDU fine error (DVM)	vdc				
B. 86	*MG CDU fine error		0. 80		1. 20	
B. 89	*OG CDU fine error (PAVM)	vac				
	*OG CDU fine error (DVM)	vdc				

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EQUIPMENT TEST  
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JDC  
NO. 12620  
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JOB LEM SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ ACC
B. 90	*OG CDU fine error		0. 80		1. 20	
B. 94	*OG IX resolver	vdc				
B. 95	*OG IX resolver	vac				
B. 96	*OG IX resolver		0. 90		1. 10	
B. 97	*IG IX resolver	vac				
B. 98	*IG IX resolver	vdc				
B. 99	*IG IX resolver		0. 90		1. 10	
B. 100	*MG IX resolver	vdc				
B. 101	*MG IX resolver	vac				
B. 102	*MG IX resolver		0. 90		1. 10	
B. 104	Row 1	deg				
	Row 2	deg				
	Row 3	deg				
B. 105	IG IX resolver cos	vac				
B. 106	IG IX resolver cos	vdc				
B. 107	IG IX resolver cos (45°)		0. 90		1. 10	
B. 108	MG IX resolver cos	vdc				
B. 109	MG IX resolver cos	vac				
B. 110	MG IX resolver cos (45°)		0. 90		1. 10	
B. 111	OG IX resolver cos	vac				

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APOLLO G8N  
EQUIPMENT TEST  
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JDC  
NO. 12620  
REV. L

JOB LEM SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ ACC
B. 112	OG 1X resolver cos	vdc				
B. 113	OG 1X resolver cos (45°)		0.90		1.10	
B. 114	IG 1X resolver sin	vdc				
B. 115	IG 1X resolver sin	vac				
B. 116	IG 1X resolver sin (45°)		0.90		1.10	
B. 117	MG 1X resolver sin	vac				
B. 118	MG 1X resolver sin	vdc				
B. 119	MG 1X resolver sin (45°)		0.90		1.10	
B. 120	OG 1X resolver sin	vdc				
B. 121	OG 1X resolver sin	vac				
B. 122	OG 1X resolver sin (45°)		0.90		1.10	
B. 124	Row 1	deg				
	Row 2	deg				
	Row 3	deg				
B. 125 (B. 105)	IG 1X resolver cos	vac				
B. 125	IG 1X resolver cos	vdc				
B. 126 (B. 106)	IG 1X resolver cos (135°)		-0.90		-1.10	
B. 127 (B. 108)	MG 1X resolver cos	vdc				

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JDC  
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JOB LEM SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ ACC
B. 127 (B. 109)	MG 1X resolver cos	vac				
B. 128	MG 1X resolver cos (135°)		-0.90		-1.10	
B. 129 (B. 111)	OG 1X resolver	vac				
B. 129	OG 1X resolver	vdc				
B. 130 (B. 112)	OG 1X resolver cos		-0.90		-1.10	
B. 131 (B. 114)	IG 1X resolver sin	vdc				
B. 131	IG 1X resolver sin	vac				
B. 132	IG 1X resolver sin (135°)		0.90		1.10	
B. 133 (B. 117)	MG 1X resolver sin	vac				
B. 133	MG 1X resolver	vdc				
B. 134	MG 1X resolver sin (135°)		0.90		1.10	
B. 135 (B. 120)	OG 1X resolver sin	vdc				
B. 135	OG 1X resolver	vac				
B. 136	OG 1X resolver sin (135°)		0.90		1.10	

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JDC  
NO. 12620  
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JOB LEM SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ ACC
B. 138	Row 1	deg				
	Row 2	deg				
	Row 3	deg				
B. 139 (B. 105)	IG 1X resolver cos	vac				
B. 139	IG 1X resolver	vdc				
B. 140	IG 1X resolver cos (225°)		-0.90		-1.10	
B. 141 (B. 108)	MG 1X resolver cos	vdc				
B. 141	MG 1X resolver	vac				
B. 142	MG 1X resolver cos (225°)		-0.90		-1.10	
B. 143 (B. 111)	OG 1X resolver	vac				
B. 143	OG 1X resolver	vdc				
B. 144	OG 1X resolver cos (225°)		-0.90		-1.10	
B. 145 (B. 114)	IG 1X resolver sin	vdc				
B. 145	IG 1X resolver	vac				
B. 146	IG 1X resolver sin (225°)		-0.90		-1.10	

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JDC  
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JOB LEM SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ ACC
B. 147 (B. 117)	MG 1X resolver sin	vac				
B. 147	MG 1X resolver	vdc				
B. 148	MG 1X resolver sin (225°)		-0.90		-1.10	
B. 149 (B. 120)	OG 1X resolver sin	vdc				
B. 149	OG 1X resolver sin	vac				
B. 150	OG 1X resolver sin (225°)		-0.90		-1.10	
B. 152	Row 1	deg				
	Row 2	deg				
	Row 3	deg				
B. 153 (B. 105)	IG 1X resolver cos	vac				
B. 153	IG 1X resolver cos	vdc				
B. 154	IG 1X resolver cos (315°)		0.90		1.10	
B. 155 (B. 108)	MG 1X resolver cos	vdc				
B. 155	MG 1X resolver	vac				
B. 156	MG 1X resolver cos (315°)		0.90		1.10	

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EQUIPMENT TEST  
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JDC  
NO. 12620  
REV. L

JOB LEM SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ ACC
B. 157 (B. 111)	OG 1X resolver cos	vac				
B. 157 (B. 112)	OG 1X resolver cos	vdc				
B. 158	OG 1X resolver cos (315°)		0.90		1.10	
B. 159 (B. 114)	IG 1X resolver sin	vdc				
B. 159 (B. 115)	IG 1X resolver sin	vac				
B. 160	IG 1X resolver sin (315°)		-0.90		-1.10	
B. 161 (B. 117)	MG 1X resolver sin	vac				
B. 161 (B. 118)	MG 1X resolver sin	vdc				
B. 162	MG 1X resolver sin (315°)		-0.90		-1.10	
B. 163 (B. 120)	OG 1X resolver sin	vdc				
B. 163 (B. 121)	OG 1X resolver sin	vac				
B. 164	OG 1X resolver sin (315°)		-0.90		-1.10	
B. 173	*Shaft CDU fine error	vdc	2.45		2.55	

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JDC  
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JOB LEM SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ ACC
B. 174	*Shaft CDU fine error	vdc	3.75		4.25	
B. 178	*Trunnion CDU fine error	vdc	3.75		4.25	
B. 179	*Trunnion CDU fine error	vdc	2.45		2.55	
B. 186	Trunnion 1X resolver sin	vdc	4.45		4.95	
B. 187	Trunnion 1X resolver cos	vdc	4.45		4.95	
B. 190	Shaft 1X resolver sin	vdc	4.45		4.95	
B. 191	Shaft 1X resolver cos	vdc	4.45		4.95	
B. 197	Yaw attitude error	vac				
B. 198	Yaw attitude error	vdc				
B. 199	Yaw attitude error		0.90		1.10	
B. 200	Pitch attitude error	vac				
B. 201	Pitch attitude error	vdc				
B. 202	Pitch attitude error		0.90		1.10	
B. 203	Roll attitude error	vac				
B. 204	Roll attitude error	vdc				
B. 205	Roll attitude error		0.90		1.10	

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EQUIPMENT TEST  
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JDC  
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JOB LEM SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

JDC ITEM NO.	CALCULATIONS
B. 33	IG Servo Error = $\frac{\text{SCA output (Step 31, Maximum Meter Spread)}}{\text{SCA input (Step 29, Maximum Meter Spread)}} = 0.91 (\pm 15\%)$
B. 38	MG Servo Error = $\frac{\text{SCA output (Step 37, Maximum Meter Spread)}}{\text{SCA input (Step 35, Maximum Meter Spread)}} = 0.91 (\pm 15\%)$
B. 43	OG Servo Error = $\frac{\text{SCA output (Step 42, Maximum Meter Spread)}}{\text{SCA input (Step 40, Maximum Meter Spread)}} = 0.91 (\pm 15\%)$
B. 82	*IG CDU Fine Error = $\frac{\text{SCA output (Step 81, vdc)} - 2.5V \text{ R\&D Bias (Step 78)}}{2.00 \times \text{SCA input (Step 81, vac)}} = 1 (\pm 20\%)$
B. 86	*MG CDU Fine Error = $\frac{\text{SCA output (Step 85, vdc)} - 2.5V \text{ R\&D Bias (Step 79)}}{2.00 \times \text{SCA input (Step 85, vac)}} = 1 (\pm 20\%)$

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FORM 00-145  
Chg. 7-4 1-5

APOLLO G&N  
EQUIPMENT TEST  
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JDC  
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JOB LEM SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

JDC ITEM NO.	CALCULATIONS
B. 90	*OG CDU Fine Error = $\frac{\text{SCA output (Step 69, vdc)} - 2.5V \text{ R\&D Bias (Step 78)}}{2.00 \times \text{SCA input (Step 69, vac)}} = 1 (\pm 20\%)$
B. 96	*OG 1X Resolver Sin ( $\pm 10^\circ$ ) = $\frac{2 \times [\text{SCA output (Step 94)} - 2.5V \text{ PCM Bias (Step 22, g)}]}{\text{SCA input (Step 95)}} = 1 (\pm 10\%)$
B. 99	*IG 1X Resolver Sin ( $\pm 10^\circ$ ) = $\frac{2 \times [\text{SCA output (Step 98)} - 2.5V \text{ PCM Bias (Step 22, g)}]}{\text{SCA input (Step 97)}} = 1 (\pm 10\%)$
B. 102	*MG 1X Resolver Sin ( $\pm 10^\circ$ ) = $\frac{2 \times [\text{SCA output (Step 100)} - 2.5V \text{ PCM Bias (Step 22, g)}]}{\text{SCA input (Step 101)}} = 1 (\pm 10\%)$
B. 107	IG 1X Resolver Cos ( $45^\circ$ ) = $\frac{8.5 \times [\text{SCA output (Step 106)} - 2.5V \text{ PCM Bias (Step 22, g)}]}{\text{SCA input (Step 105)}} = 1 (\pm 10\%)$

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JDC  
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JOB LEM SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

JDC ITEM NO.	CALCULATIONS
B. 110	MG IX Resolver Cos (45°) = $8.5 \times \frac{[SCA \text{ output (Step 108)} - 2.5V \text{ PCM Bias (Step 22. g)}]}{SCA \text{ Input (Step 109)}} = 1 (\pm 10\%)$
B. 113	OG IX Resolver Cos (45°) = $8.5 \times \frac{[SCA \text{ Output (Step 112)} - 2.5V \text{ PCM Bias (Step 22. g)}]}{SCA \text{ Input (Step 111)}} = 1 (\pm 10\%)$
B. 116	IG IX Resolver Sin (45°) = $8.5 \times \frac{[SCA \text{ Output (Step 114)} - 2.5V \text{ PCM Bias (Step 22. g)}]}{SCA \text{ Input (Step 115)}} = 1 (\pm 10\%)$
B. 119	MG IX Resolver Sin (45°) = $8.5 \times \frac{[SCA \text{ Output (Step 118)} - 2.5V \text{ PCM Bias (Step 22. g)}]}{SCA \text{ Input (Step 117)}} = 1 (\pm 10\%)$
B. 122	OG IX Resolver Sin (45°) = $8.5 \times \frac{[SCA \text{ Output (Step 120)} - 2.5V \text{ PCM Bias (Step 22. g)}]}{SCA \text{ Input (Step 121)}} = 1 (\pm 10\%)$

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FORM 0-148  
Chg. 7-2 3-65

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JDC  
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JOB LEM SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

JDC ITEM NO.	CALCULATIONS
B. 126	IG IX Resolver Cos (135°) = $8.5 \times \frac{[SCA \text{ Output (Step 125, 106)} - 2.5V \text{ PCM Bias (Step 22. g)}]}{SCA \text{ Input (Step 125, 105)}} = -1 (\pm 10\%)$
B. 128	MG IX Resolver Cos (135°) = $8.5 \times \frac{[SCA \text{ Output (Step 127, 108)} - 2.5V \text{ PCM Bias (Step 22. g)}]}{SCA \text{ Input (Step 127, 109)}} = -1 (\pm 10\%)$
B. 130	OG IX Resolver Cos (135°) = $8.5 \times \frac{[SCA \text{ Output (Step 129, 112)} - 2.5V \text{ PCM Bias (Step 22. g)}]}{SCA \text{ Input (Step 129, 111)}} = -1 (\pm 10\%)$
B. 132	IG IX Resolver Sin (135°) = $8.5 \times \frac{[SCA \text{ Output (Step 131, 114)} - 2.5V \text{ PCM Bias (Step 22. g)}]}{SCA \text{ Input (Step 131, 115)}} = 1 (\pm 10\%)$
B. 134	MG IX Resolver Sin (135°) = $8.5 \times \frac{[SCA \text{ Output (Step 133, 118)} - 2.5V \text{ PCM Bias (Step 22. g)}]}{SCA \text{ Input (Step 133, 117)}} = 1 (\pm 10\%)$

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FORM 0-148  
Chg. 7-2 3-65

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JDC  
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JOB LEM SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

JDC ITEM NO.	CALCULATIONS
B. 136	OG IX Resolver Sin (135°) = $8.5 \times \frac{[SCA \text{ Output (Step 135, 120)} - 2.5V \text{ PCM Bias (Step 22. g)}]}{SCA \text{ Input (Step 135, 121)}} = 1 (\pm 10\%)$
B. 140	IG IX Resolver Cos (225°) = $8.5 \times \frac{[SCA \text{ Output (Step 139, 106)} - 2.5V \text{ PCM Bias (Step 22. g)}]}{SCA \text{ Input (Step 139, 105)}} = -1 (\pm 10\%)$
B. 142	MG IX Resolver Cos (225°) = $8.5 \times \frac{[SCA \text{ Output (Step 141, 108)} - 2.5V \text{ PCM Bias (Step 22. g)}]}{SCA \text{ Input (Step 141, 109)}} = -1 (\pm 10\%)$
B. 144	OG IX Resolver Cos (225°) = $8.5 \times \frac{[SCA \text{ Output (Step 143, 112)} - 2.5V \text{ PCM Bias (Step 22. g)}]}{SCA \text{ Input (Step 143, 111)}} = -1 (\pm 10\%)$
B. 146	IG IX Resolver Sin (225°) = $8.5 \times \frac{[SCA \text{ Output (Step 145, 114)} - 2.5V \text{ PCM Bias (Step 22. g)}]}{SCA \text{ Input (Step 145, 115)}} = -1 (\pm 10\%)$

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FORM 0-148  
Chg. 7-2 3-65

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JDC  
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JOB LEM SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

JDC ITEM NO.	CALCULATIONS
B. 148	MG IX Resolver Sin (225°) = $8.5 \times \frac{[SCA \text{ Output (Step 147, 118)} - 2.5V \text{ PCM Bias (Step 22. g)}]}{SCA \text{ Input (Step 147, 117)}} = -1 (\pm 10\%)$
B. 150	OG IX Resolver Sin (225°) = $8.5 \times \frac{[SCA \text{ Output (Step 149, 120)} - 2.5V \text{ PCM Bias (Step 22. g)}]}{SCA \text{ Input (Step 149, 121)}} = -1 (\pm 10\%)$
B. 154	IG IX Resolver Cos (315°) = $8.5 \times \frac{[SCA \text{ Output (Step 153, 106)} - 2.5V \text{ PCM Bias (Step 22. g)}]}{SCA \text{ Input (Step 153, 105)}} = 1 (\pm 10\%)$
B. 156	MG IX Resolver Cos (315°) = $8.5 \times \frac{[SCA \text{ Output (Step 155, 108)} - 2.5V \text{ PCM Bias (Step 22. g)}]}{SCA \text{ Input (Step 155, 109)}} = 1 (\pm 10\%)$
B. 158	OG IX Resolver Cos (315°) = $8.5 \times \frac{[SCA \text{ Output (Step 157, 112)} - 2.5V \text{ PCM Bias (Step 22. g)}]}{SCA \text{ Input (Step 157, 111)}} = 1 (\pm 10\%)$

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JDC  
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JOB LEM SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

JDC ITEM NO.	CALCULATIONS
B. 160	$\text{IG IX Resolver Sin } (315^\circ) =$ $8.5 \times \left[ \frac{\text{SCA Output (Step 159, 114)} - 2.5 \text{ V PCM Bias (Step 22, g)}}{\text{SCA Input (Step 159, 115)}} \right] = -1 (\pm 10\%)$
B. 162	$\text{MG IX Resolver Sin } (315^\circ) =$ $8.5 \times \left[ \frac{\text{SCA Output (Step 161, 118)} - 2.5 \text{ V PCM Bias (Step 22, g)}}{\text{SCA Input (Step 161, 117)}} \right] = -1 (\pm 10\%)$
B. 164	$\text{OG IX Resolver Sin } (315^\circ) =$ $8.5 \times \left[ \frac{\text{SCA Output (Step 163, 120)} - 2.5 \text{ V PCM Bias (Step 22, g)}}{\text{SCA Input (Step 163, 121)}} \right] = -1 (\pm 10\%)$
B. 199	$\text{Yaw Attitude Error} =$ $2.44 \times \left[ \frac{\text{SCA Output (Step 198)} - 2.5 \text{ V PCM Bias (Step 22, g)}}{\text{SCA Input (Step 197)}} \right] = 1 (\pm 10\%)$
B. 202	$\text{Pitch Attitude Error} =$ $2.44 \times \left[ \frac{\text{SCA Output (Step 201)} - 2.5 \text{ V PCM Bias (Step 22, g)}}{\text{SCA Input (Step 200)}} \right] = 1 (\pm 10\%)$

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FORM 04 148  
Chg. 7-2 1-6

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JDC  
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JOB LEM SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

JDC ITEM NO.	CALCULATIONS
B. 205	$\text{Roll Attitude Error} =$ $2.44 \times \left[ \frac{\text{SCA Output (Step 204)} - 2.5 \text{ V PCM Bias (Step 22, g)}}{\text{SCA Input (Step 203)}} \right] = 1 (\pm 10\%)$

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LEM SIGNAL CONDITIONER  
JOB FUNCTIONAL CHECKOUT

JDC 12620 REV. 32757 D.S. PGS. 9  
INITIAL TORR

SUBSYSTEM LEM G & N SYSTEM

ASSY.

DESCRIPTION This JDC provides a functional checkout procedure for the Signal Conditioner Module. Functional operation is evaluated by checking Signal Conditioner Module Input and output data for proper correlation. Procedural methods are incorporated to cause signal generation in normally nulled loops where possible in a G and N test configuration for maximum checkout capability.

Rev.	Date	TORR	PAGES REVISED	APPROVAL	REFERENCES
Let.	NO.	JDC	D. S.	MIT	PS 6015000 JDC 12614
					IMPORTANT
					INTERVAL
					TOOLS AND MATERIAL

A. PREPARATION

1. Perform JDC 12614 to downmode to OIA PILOT POWER mode.  
CAUTION: Extreme care must be exercised when mating connectors, to prevent pin and jack damage.  
2. Visually inspect J2 on Signal Conditioner Module (SCM) breakout box and 3031 on SCM to insure that pins and sockets are not bent or damaged.  
3. Carefully locate J2 on guide pins of 3031; ease plug onto connector, maintaining parallelism between plug and connector as closely as possible, and engage four corner jackscrews until finger tight.

4. Turn each jackscrew one turn at a time moving around connector in sequence until plug and connector are fully engaged. When fully engaged, torque each jackscrew to 19 (±1) inch-pounds.  
5. Tighten two captive screws on SCM connector to 19 (±1) inch-pounds.  
6. Perform JDC 12614 to advance G and N system to standby mode.  
7. Connect PSA Test Point Adapter (TPA) direct probes to TB1 Jack 29 (high) and TB5 Jack 22 (low).  
8. Connect jumper between PROBES OUTPUT DIRECT Jacks and DVM IN Jacks on Auxiliary Input Panel.

VERIFICATION WITH SIDL REQUIRED BEFORE USE

DATE

LEM SIGNAL CONDITIONER  
JOB FUNCTIONAL CHECKOUT

JDC 12620 REV. - PAGE 2 OF 10

SUBSYSTEM LEM G & N SYSTEM

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9. Adjust GAN POWER ADJUST control on Test Control panel until digital voltmeter (DVM) indicates 28 (±0.25) vdc.

B. PROCEDURE

28 VDC STANDBY AND OPERATE

1. Connect SCM GSE Distribution Box (GDB) stepper switch to DVM by setting CROSSBAR CONTROL switches on Primary Signal Selector panel to 271.

NOTE: To position test selector panel, perform following operations:  
a. Press SIGNAL CONDITIONER LEVEL 1  
ENABLE pushbutton if first digit on test selector panel position is 1, or press SIGNAL CONDITIONER LEVEL 2 ENABLE pushbutton if first digit is 2.  
b. Press PUSH TO ADVANCE pushbutton until display indicates last two digits.

2. Set Test Selector panel to positions indicated and measure and record following voltages on DVM:

Test Selector Panel Position	Voltage
101	28 vdc LGC operate
103	28 vdc DMU standby

PIPA S/G OUTPUT

3. Connect following signals to oscillograph by setting switches on oscillograph signal selector panel to positions indicated:

Switch	Signal
CHANNEL 4 to 1	Z PIPA S/G output
CHANNEL 5 to 1	Y PIPA S/G output
CHANNEL 6 to 1	X PIPA S/G output
CHANNEL 8 to 4	SCM GDB stepper switch

4. Insure that CH AC indicators are lighted for channels 4, 5, and 6.  
5. Zero oscillograph channels 4, 5, and 6 and set gains at 500 mv/mm. Set gain of channel 8 at 2 v/cm and zero adjust channel 8 for a centered trace with a 2.5 vdc bias input.

6. Insure that PROCEED Indicator of PROCEED/ISS OPERATE pushbutton on test control panel is lighted.

7. Press CHART SPEEDS 5 pushbutton on oscillograph control panel and set CHART DRIVE switch to MM/SEC.

8. Obtain oscillograph record of PIPA loop closure data by performing following steps successively for each position of Test Selector panel listed in table I:

- a. After at least 30 seconds in ISS standby mode, press PROCEED/ISS OPERATE pushbutton on Test Control panel.

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LEM SIGNAL CONDITIONER  
JOB FUNCTIONAL CHECKOUT

JDC 12620 REV. - PAGE 3 OF 10

SUBSYSTEM LEM G & N SYSTEM

ASSY

- b. Press IMU CAGE/COMMAND pushbutton.

- c. Wait at least 10 seconds for PIPA loop closure, then press PROCEED/ISS STANDBY pushbutton.

Test Selector Panel Position	Signal
105	Z PIPA S/G quadrature output
107	Y PIPA S/G quadrature output
108	X PIPA S/G quadrature output
117	Z PIPA S/G in-phase output
118	Y PIPA S/G in-phase output
119	X PIPA S/G in-phase output

9. Stop oscillograph. Check oscillograph record for 6 indications of PIPA loop closure on channel 8 correlating to the loop closure indications on channels 4, 5, and 6. Record that traces have centered after loop closure.

POWER SUPPLY AND TEMPERATURE

10. Press PROCEED/ISS OPERATE pushbutton on Test Control panel and wait 90 seconds, then repeat step A.9.

11. Set Test Selector panel to positions indicated and measure and record following voltages on DVM:

SUBSYSTEM LEM G & N SYSTEM

ASSY

- CHANNEL 3 to 2 OG servo error
- CHANNEL 8 to 4 SCM GDB stepper switch

14. Insure that CH 3 AC indicator is lighted.

15. Zero oscillograph channels 1, 2, and 3 and set gains at 500 mv/mm. Set gain of channel 8 at 2 v/cm and zero adjust channel 8 for a centered trace with a 2.5 vdc bias input.

16. Press CHART SPEEDS 5 pushbutton on Oscillograph Control panel.

17. Set switches on Signal Generator as follows:

- a. FUNCTION to SINE
- b. RANGE to X.01
- c. FREQUENCY meter to 20.

18. Set NOR/USE CAL switch inside Auxiliary Input Panel to NOR.

19. Perform following DSKY operations:

- a. VERB 42 ENTR
- b. VERB 33 ENTR

20. Set CHART DRIVE switch on Oscillograph Control panel to MM/SEC.

21. Press TEST START pushbutton on Test Selector panel.

22. Obtain an oscillograph trace of stabilization loop servo error data by increasing the signal generator AMPLITUDE control to three-fourths of maximum for approximately 10 seconds for each test listed in table II.

Test	GIMBAL SERVO TEST Switch Position	Test Selector Panel Position	Signal
a	1	137	IG servo error
b	2	138	MG servo error
c	3	139	OG servo error

IG, MG, AND OG TORQUE MOTOR CURRENTS

24. Insure that AMPLITUDE control on signal generator is set to 0.

25. Connect jumper between PROBES OUTPUT DIRECT Jacks and CH 6 DC IN Jacks on Auxiliary Input Panel.

26. Set OSCILLOGRAPH SELECTOR CHANNEL 6 switch on Oscillograph Signal Selector panel to 15.

27. Zero oscillograph channel 6 and set gain at 0.2 v/cm. Set gain of channel 8 at 1 v/cm and zero adjust channel 8 for a centered trace with a 2.5 vdc bias input.

28. Set FREQUENCY meter on Signal Generator to 50 and RANGE switch to X1.

29. Set CHART DRIVE switch on Oscillograph Control panel to MM/SEC.

DATE



# LEM SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

JDC 12620 REV. 32757 DS.P05 9

## SUBSYSTEM LEM G & N SYSTEM

DESCRIPTION This JDC provides a functional checkout procedure for the Signal Conditioner Module. Functional operation is evaluated by checking Signal Conditioner Module Input and output data for proper correlation. Procedural methods are incorporated to cause signal generation in normally nullified loops where possible in a G and N test configuration for maximum checkout capability.

Rev.	Date	TORR NO.	PAGES REVISED	APPROVAL	REFERENCES
1st		JDC	D.S.	MIT NASA	PS 6015000 JDC 12614
					IMPORTANT
					INTERVAL
					TOOLS AND MATERIAL

### A. PREPARATION

- Perform JDC 12614 to downmode to OIA PILOT POWER mode.  
CAUTION: Extreme care must be exercised when mating connectors, to prevent pin and jack damage.
- Visually inspect J2 on Signal Conditioner Module (SCM) breakout box and 30J1 on SCM to insure that pins and sockets are not bent or damaged.
- Carefully locate J2 on guide pins of 30J1; ease plug onto connector, maintaining parallelism between plug and connector as closely as possible, and engage four corner jackscrews until finger tight.

VERIFICATION WITH SIG REQUIRED BEFORE USE

DATE \_\_\_\_\_

# LEM SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

JDC 12620 REV. PAGE 2 OF 10

## SUBSYSTEM LEM G & N SYSTEM

### ASSY

- Adjust G&N POWER ADJUST control on Test Control panel until digital voltmeter (DVM) indicates 28 (+0.25) vdc.

### B. PROCEDURE

#### 28 VDC STANDBY AND OPERATE

- Connect SCM GSE Distribution Box (GDB) stepper switch to DVM by setting CROSSBAR CONTROL switches on Primary Signal Selector panel to 271.

NOTE: To position test

selector panel, perform following operations:

- Press SIGNAL CONDITIONER LEVEL 1

ENABLE pushbutton if

first digit on test selector

panel position is 1, or press

SIGNAL CONDITIONER

LEVEL 2 ENABLE push-

button if first digit is 2.

- Press PUSH TO

ADVANCE pushbutton until

display indicates last two

digits.

- Set Test Selector panel to positions indicated and measure and record following voltages on DVM:

Test Selector Panel Position	Voltage
101	28 vdc LDC operate
102	28 vdc IMU standby

DATE \_\_\_\_\_

# LEM SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

JDC 12620 REV. PAGE 3 OF 10

## SUBSYSTEM LEM G & N SYSTEM

### b. Press IMU CAGE/COMMAND push-

button.

- Wait at least 10 seconds for PIPA loop closure, then press PROCEED/ISS STANDBY pushbutton.

Table I

Test Selector Panel Position	Signal
105	Z PIPA S/G quadrature output
107	Y PIPA S/G quadrature output
108	X PIPA S/G quadrature output
117	Z PIPA S/G in-phase output
118	Y PIPA S/G in-phase output
119	X PIPA S/G in-phase output

- Stop oscillograph. Check oscillograph record for 6 indications of PIPA loop closure on channel 8 correlating to the loop closure indications on channels 4, 5, and 6. Record that traces have centered after loop closure.

#### POWER SUPPLY AND TEMPERATURE

- Press PROCEED/ISS OPERATE pushbutton on Test Control panel and wait 90 seconds, then repeat step A.9.

- Set Test Selector panel to positions indicated and measure and record following voltages on DVM:

Test Selector Panel Position	Signal
104	2.5 vdc PCM bias
145	R&D 2.5 vdc bias
103	120 vdc reference
106	3200 cps 28 volt supply
113	800 cps 28 volt supply
135	cal mod temperature
150	IMU heater current
151	IMU blower current
201	PIPA temperature
202	IRIG temperature

IG, MG, AND OG SERVO ERRORS

- Perform following DSKY operations:

- VERB 41 NOUN 20 ENTR
- Observe: VERB 21 NOUN 22 Flashing
- Observe: VERB 21 NOUN 22 ENTR
- Observe: VERB 22 NOUN 22 Flashing
- Observe: VERB 23 NOUN 22 Flashing
- Observe: VERB 23 NOUN 22 ENTR
- Observe: VERB 23 NOUN 22 Flashing
- Observe: VERB 23 NOUN 22 ENTR

- Connect following signals to oscillograph by setting following switches on Oscillograph Signal Selector panel to positions indicated:

Test Selector Panel Position	Signal
104	2.5 vdc PCM bias
145	R&D 2.5 vdc bias
103	120 vdc reference
106	3200 cps 28 volt supply
113	800 cps 28 volt supply
135	cal mod temperature
150	IMU heater current
151	IMU blower current
201	PIPA temperature
202	IRIG temperature

CHANNEL 1 to 2 . IG servo error  
CHANNEL 3 to 2 . MG servo error

DATE \_\_\_\_\_

# LEM SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

JDC 12620 REV. PAGE 4 OF 10

## SUBSYSTEM LEM G & N SYSTEM

### ASSY

- Stop oscillograph. Record peak-to-peak SCM input signals monitored on channels 1, 2, and 3, and peak-to-peak SCM output signals monitored on channel 8.

Table II

Test Selector Panel Position	Signal
1	137 IG servo error
2	138 MG servo error
3	139 OG servo error

IG, MG, AND OG TORQUE MOTOR CURRENTS

- Insure that AMPLITUDE control on signal generator is set to 0.

- Connect jumper between PROBES OUTPUT DIRECT jacks and CH 6 DC IN jacks on Auxiliary Input Panel.

- Set OSCILLOGRAPH SELECTOR CHANNEL 6 switch on Oscillograph Signal Selector panel to 15.

- Zero oscillograph channel 6 and set gain at 0.2 v/cm. Set gain of channel 8 at 1 v/cm and zero adjust channel 8 for a centered trace with a 2.5 vdc bias input.

- Set FREQUENCY meter on Signal Generator to 50 and RANGE switch to X1.

- Set CHART DRIVE switch on Oscillograph Control panel to MM/SEC.

DATE \_\_\_\_\_



LEM SIGNAL CONDITIONER  
JOB FUNCTIONAL CHECKOUT

JDC 12620 REV - PAGE 5 OF 10

SUBSYSTEM LEM G & N SYSTEM

30. Set CROSSBAR CONTROL switches on Primary Signal Selector panel to 176 to monitor signal generator output on oscilloscope.

31. Obtain oscillograph trace of torque motor currents by increasing signal generator AMPLITUDE control until oscilloscope indicates value listed in table III for each test. Maintain signal generator setting for approximately 10 seconds. For each test, connect PSA TPA direct probes, set Test Selector panel, and set GIMBAL SERVO TEST switch as indicated.

32. Stop oscillograph. Record peak-to-peak SCM input signal monitored on channel 6 and peak-to-peak SCM output signal monitored on channel 8.

CDU FINE ERROR

33. Connect jumper between PROBES OUTPUT BUFFERED jacks and PAVM IN jacks on Auxiliary Input Panel.

NOTE: Ignore ISS warning lamp indication in steps 34 and 35.

Table III

Test	Signal Generator Output	PSA TPA Test Points	Test Selector Panel Position	GIMBAL SERVO TEST Switch Position	Signal
a	2V peak-to-peak	TB2-31	TB1-49	1	IG torque motor current
b	1V peak-to-peak	TB2-32	TB1-49	2	MG torque motor current
c	1V peak-to-peak	TB1-45	TB1-49	3	OG torque motor current

DATE

LEM SIGNAL CONDITIONER  
JOB FUNCTIONAL CHECKOUT

JDC 12620 REV - PAGE 6 OF 10

SUBSYSTEM LEM G & N SYSTEM

Table IV

Test	PSA TPA Test Points		Test Selector Panel Position	Signal
	High	Low		
a	TB3-37	TB3-34	140	IG CDU fine error
b	TB3-38	TB3-34	141	MG CDU fine error
c	TB3-41	TB3-34	142	OG CDU fine error

36. Enter VERB 34 into DSKY and press ENTR pushbutton.

IX RESOLVER SIN ±10 DEGREES

37. Perform following DSKY operations:

a. VERB 41 NOUN 20 ENTR

b. Observe: VERB 21 NOUN 22 Flashing ENTR

c. +01000

d. Observe: VERB 22 NOUN 22 Flashing ENTR

e. +01000

f. Observe: VERB 23 NOUN 22 Flashing ENTR

g. +01000

38. Connect jumper between Jack J4 pin F and PAVM IN jacks on Auxiliary Input Panel.

39. Perform following DSKY operations:

a. VERB 42 ENTR

b. VERB 33 ENTR

40. Connect SCM input to PAVM and SCM output to DVM by setting Test Selector panel and CROSSBAR CONTROL switches to positions listed in table V. For each test, perform following operations:

Table V

Test	CROSSBAR CONTROL Panel Position	Test Selector Panel Position	Signal
a	142	203	OG 1X resolver sin ±10°
b	143	205	MG 1X resolver sin ±10°
c	144	204	IG 1X resolver sin ±10°

IX RESOLVER SIN AND COS

41. Perform following DSKY operations:

a. VERB 41 NOUN 20 ENTR

b. Observe: VERB 21 NOUN 22 Flashing ENTR

c. +04500

d. Observe: VERB 22 NOUN 22 Flashing ENTR

e. +04500

f. Observe: VERB 23 NOUN 22 Flashing ENTR

g. +04500

42. Wait 20 seconds after performing step 41, then perform following DSKY operations:

a. VERB 42 ENTR

b. VERB 33 ENTR

LEM SIGNAL CONDITIONER  
JOB FUNCTIONAL CHECKOUT

JDC 12620 REV - PAGE 7 OF 10

SUBSYSTEM LEM G & N SYSTEM

Table VI

Test	CROSSBAR CONTROL Panel Position	Signal
a	120	IG 1X resolver cos
b	121	MG 1X resolver cos
c	122	OG 1X resolver cos
d	123	IG 1X resolver sin
e	124	MG 1X resolver sin
f	125	OG 1X resolver sin

44. Perform following DSKY operations:

a. VERB 41 NOUN 20 ENTR

b. Observe: VERB 21 NOUN 22 Flashing

Table VII

Test	CROSSBAR CONTROL Panel Position	Signal
a	120	IG 1X resolver cos
b	121	MG 1X resolver cos
c	122	OG 1X resolver cos
d	123	IG 1X resolver sin
e	124	MG 1X resolver sin
f	125	OG 1X resolver sin

45. Insure that Resolver Circuit Tester is connected to cable W172.

46. Set 800 REFERENCE INPUT VOLTAGE switch on Decade Error Bridge panel to 28V.

47. Press POWER ON pushbutton on Resolver Circuit Tester Control panel.

48. Set RESOLVER ANGLE TRANSMITTER control to 0.

49. Press READ MODE/SET MODE pushbutton to light SET MODE indicator.

50. Press SHAFT SELECT/SET ENABLE pushbutton.

51. Connect shaft CDU fine error output from SCM to DVM by setting Test Selector panel to 146.

52. Perform following DSKY operations:

a. VERB 40 NOUN 40 ENTR

b. VERB 21 NOUN 10 ENTR

c. 00012

d. 00011

53. Monitor SCM input on PAVM by connecting PSA TPA buffered probe to TB3 Jack 33 (high) and TB3 Jack 34 (low) and connecting a jumper between PROBES OUTPUT BUFFERED jacks and PAVM IN jacks on Auxiliary Input Panel.

DATE

LEM SIGNAL CONDITIONER  
JOB FUNCTIONAL CHECKOUT

JDC 12620 REV - PAGE 8 OF 10

SUBSYSTEM LEM G & N SYSTEM

Table VIII

Test	CROSSBAR CONTROL Panel Position	Signal
a	128	Trunnion 1X resolver sin
b	131	Trunnion 1X resolver cos

54. Adjust RESOLVER ANGLE TRANSMITTER control to produce a minimum signal on PAVM. Record DVM indication.

NOTE: PGNS caution lamp on Indicator Control panel will light during steps 55 through 59. Ignore lamp indication.

55. Adjust RESOLVER ANGLE TRANSMITTER control until PAVM indicates 722 mv. Record DVM indication.

56. Press TRUN SELECT/SET ENABLE pushbutton.

57. Connect trunnion CDU fine error output from SCM to DVM by setting Test Selector panel to 147.

58. Remove PSA TPA buffered probe from TB3 Jack 33 and connect to TB3 Jack 30 (high).

59. Adjust RESOLVER ANGLE TRANSMITTER control until PAVM indicates 722 mv. Record DVM indication.

60. Adjust RESOLVER ANGLE TRANSMITTER control until PAVM indicates minimum signal. Record DVM indication.

61. Perform following DSKY operations:

a. VERB 21 NOUN 10 ENTR

b. 00012

c. 00010

62. Enter VERB 06 NOUN 40 into DSKY and press ENTR pushbutton.

DATE

LEM SIGNAL CONDITIONER  
JOB FUNCTIONAL CHECKOUT

JDC 12620 REV - PAGE 5 OF 10

SUBSYSTEM LEM G & N SYSTEM

30. Set CROSSBAR CONTROL switches on Primary Signal Selector panel to 176 to monitor signal generator output on oscilloscope.

31. Obtain oscillograph trace of torque motor currents by increasing signal generator AMPLITUDE control until oscilloscope indicates value listed in table III for each test. Maintain signal generator setting for approximately 10 seconds. For each test, connect PSA TPA direct probes, set Test Selector panel, and set GIMBAL SERVO TEST switch as indicated.

32. Stop oscillograph. Record peak-to-peak SCM input signal monitored on channel 6 and peak-to-peak SCM output signal monitored on channel 8.

CDU FINE ERROR

33. Connect jumper between PROBES OUTPUT BUFFERED jacks and PAVM IN jacks on Auxiliary Input Panel.

NOTE: Ignore IBS warning lamp indication in steps 34 and 35.

CDU FINE ERROR

34. Perform following DSKY operations:

- VERB 25 NOUN 26 ENTR
- 04000 ENTR
- 03647 ENTR
- 42005 ENTR
- VERB 30 ENTR
- Observe: VERB 21 NOUN 22 Flashing (after approximately 20 seconds) ENTR
- +00100 ENTR
- Observe: VERB 22 NOUN 22 Flashing ENTR
- +00100 ENTR
- Observe: VERB 23 NOUN 22 Flashing ENTR
- +00100 ENTR

35. Connect SCM input to PAVM and SCM output to DVM by connecting PSA TPA buffered probes to test points listed in table IV and setting Test Selector panel to positions indicated. Wait 90 seconds; then record SCM input on PAVM and SCM output on DVM simultaneously for each test.

Table III

Test	Signal Generator Output	PSA TPA Test Points	GIMBAL SERVO TEST Switch Position	Signal
a	2V peak-to-peak	120-31	1	IG torque motor current
b	1V peak-to-peak	120-32	2	MG torque motor current
c	1V peak-to-peak	120-45	3	OG torque motor current

DATE \_\_\_\_\_

LEM SIGNAL CONDITIONER  
JOB FUNCTIONAL CHECKOUT

JDC 12620 REV - PAGE 6 OF 10

SUBSYSTEM LEM G & N SYSTEM

Table IV

Test	PSA TPA Test Points	Test Selector Panel Position	Signal
a	120-37	140	IG CDU fine error
b	120-38	141	MG CDU fine error
c	120-41	142	OG CDU fine error

36. Enter VERB 34 into DSKY and press ENTR pushbutton.

IX RESOLVER SIN ±10 DEGREES

37. Perform following DSKY operations:

- VERB 41 NOUN 20 ENTR

Observe: VERB 21 NOUN 22 Flashing

c. +01000 ENTR

d. Observe: VERB 22 NOUN 22 Flashing

e. +01000 ENTR

f. Observe: VERB 23 NOUN 22 Flashing

g. +01000 ENTR

38. Connect jumper between jack J4 pin F and PAVM IN jacks on Auxiliary Input Panel.

39. Perform following DSKY operations:

- VERB 42 ENTR
- VERB 33 ENTR

40. Connect SCM input to PAVM and SCM output to DVM by setting Test Selector panel and CROSSBAR CONTROL switches to positions listed in table V. For each test, perform following operations:

- VERB 42 ENTR
- VERB 33 ENTR

41. Perform following DSKY operations:

- VERB 41 NOUN 20 ENTR

Observe: VERB 21 NOUN 22 Flashing

c. +04500 ENTR

d. Observe: VERB 22 NOUN 22 Flashing

e. +04500 ENTR

f. Observe: VERB 23 NOUN 22 Flashing

g. +04500 ENTR

42. Wait 20 seconds after performing step 41, then perform following DSKY operations:

- VERB 42 ENTR
- VERB 33 ENTR

43. Connect SCM output and SCM input to DVM for each test listed in table VI. For each test, perform following operations:

- Set Test Selector panel to position listed and record DVM indication.

44. Immediately set CROSSBAR CONTROL switches on Primary Signal Selector panel to position listed and record DVM indication.

45. Set CROSSBAR CONTROL switches to 271.

LEM SIGNAL CONDITIONER  
JOB FUNCTIONAL CHECKOUT

JDC 12620 REV - PAGE 7 OF 10

SUBSYSTEM LEM G & N SYSTEM

Table VI

Test	CROSSBAR CONTROL Position	Signal
a	120	IG 1X resolver cos
b	121	MG 1X resolver cos
c	122	OG 1X resolver cos
d	123	IG 1X resolver sin
e	124	MG 1X resolver sin
f	125	OG 1X resolver sin

44. Perform following DSKY operations:

- VERB 41 NOUN 20 ENTR

Observe: VERB 21 NOUN 22 Flashing

Table VII

Test	PSA TPA Test Points	GIMBAL SERVO TEST Switch Position	Signal
a	120-37	140	IG torque motor current
b	120-38	141	MG torque motor current
c	120-41	142	OG torque motor current

45. Insure that Resolver Circuit Tester is connected to cable W172.

46. Set 800 REFERENCE INPUT VOLTAGE switch on Decade Error Bridge panel to 26V.

47. Press POWER ON pushbutton on Resolver Circuit Tester Control panel.

48. Set RESOLVER ANGLE TRANSMITTER control to 0.

49. Press READ MODE/SET MODE pushbutton to light SET MODE indicator.

50. Press SHAFT SELECT/SET ENABLE pushbutton.

51. Connect shaft CDU fine error output from SCM to DVM by setting Test Selector panel to 146.

52. Perform following DSKY operations:

- VERB 40 NOUN 40 ENTR
- VERB 21 NOUN 10 ENTR
- 00012 ENTR
- 00011 ENTR

53. Monitor SCM input on PAVM by connecting PSA TPA buffered probe to TB3 jack 33 (high) and TB3 jack 34 (low) and connecting a jumper between PROBES OUTPUT BUFFERED jacks and PAVM IN jacks on Auxiliary Input Panel.

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LEM SIGNAL CONDITIONER  
JOB FUNCTIONAL CHECKOUT

JDC 12620 REV - PAGE 8 OF 10

SUBSYSTEM LEM G & N SYSTEM

Table VIII

Test	PSA TPA Test Points	Test Selector Panel Position	Signal
a	120-37	140	IG torque motor current
b	120-38	141	MG torque motor current
c	120-41	142	OG torque motor current

54. Adjust RESOLVER ANGLE TRANSMITTER control to produce a minimum signal on PAVM. Record DVM indication.

NOTE: PGNS caution lamp on Indicator Control panel will light during steps 55 through 59. Ignore lamp indication.

55. Adjust RESOLVER ANGLE TRANSMITTER control until PAVM indicates 722 mv. Record DVM indication.

56. Press TRUN SELECT/SET ENABLE pushbutton.

57. Connect trunnion CDU fine error output from SCM to DVM by setting Test Selector panel to 147.

58. Remove PSA TPA buffered probe from TB3 jack 33 and connect to TB3 jack 30 (high).

59. Adjust RESOLVER ANGLE TRANSMITTER control until PAVM indicates 722 mv. Record DVM indication.

60. Adjust RESOLVER ANGLE TRANSMITTER control until PAVM indicates minimum signal. Record DVM indication.

61. Perform following DSKY operations:

- VERB 21 NOUN 10 ENTR
- 00012 ENTR
- 00010 ENTR

62. Enter VERB 06 NOUN 40 into DSKY and press ENTR pushbutton.

63. Adjust RESOLVER ANGLE TRANSMITTER control until row 2 of DSKY indicates 45000.

64. Set Test Selector panel to following positions. At each position, record SCM output of following signals on DVM:

- Test Selector Panel Position 128 Trunnion 1X resolver sin
- 131 Trunnion 1X resolver cos

65. Press SHAFT SELECT/SET ENABLE pushbutton on Resolver Circuit Tester Control panel.

66. Set Test Selector panel to following positions. At each position, record SCM output of following signals on DVM:

- Test Selector Panel Position 129 Shaft 1X resolver sin
- 130 Shaft 1X resolver cos

67. Set 800 REFERENCE INPUT VOLTAGE switch on Decade Error Bridge panel to OFF.

68. Set RESOLVER ANGLE TRANSMITTER control to 0.

YAW, PITCH, AND ROLL ATTITUDE ERRORS

69. Perform following DSKY operations:

- VERB 42 NOUN 20 ENTR
- Observe: VERB 21 NOUN 22 Flashing
- +00000 ENTR
- Observe: VERB 22 NOUN 22 Flashing

DATE \_\_\_\_\_

LEM SIGNAL CONDITIONER  
JOB FUNCTIONAL CHECKOUT

JDC 12620 REV - PAGE 8 OF 10

SUBSYSTEM LEM G & N SYSTEM

ASSY

Table VII

Test	PSA TPA Test Points	Test Selector Panel Position	Signal
	High	Low	
a	TB4-14	TB4-18	114 Yaw attitude error
b	TB4-45	TB4-49	115 Pitch attitude error
c	TB4-13	TB4-17	116 Roll attitude error

74. Perform JDC 12614 to turn off G and N system.

71. Perform following DSKY operations:

a. VERB 43 ENTR

b. Observe: VERB 21 NOUN 22 Flashing ENTR

c. +01600

d. Observe: VERB 22 NOUN 22 Flashing ENTR

e. +01600

f. Observe: VERB 23 NOUN 22 Flashing ENTR

g. +01600

72. Connect jumper between PROBES OUTPUT DIRECT jacks and PAVM IN jacks on Auxiliary Input Panel.

73. Connect SCM input to PAVM and SCM output to DVM by connecting PSA TPA direct probe to test points listed in table VII and setting Test Selector panel to positions indicated. Record SCM input on PAVM and SCM output on DVM for each test.

C. CALCULATIONS

1. Perform following CDU fine error calculations:

a. IG CDU fine error =

SCM output (DVM) - 2.5V bias

2.08 x SCM input (PAVM)

= 1 (±10%)

b. MG CDU fine error =

SCM output (DVM) - 2.5V bias

2.08 x SCM input (PAVM)

= 1 (±10%)

c. OG CDU fine error =

SCM output (DVM) - 2.5V bias

2.08 x SCM input (PAVM)

= 1 (±10%)

2. Perform following 1X resolver sin ±10 degree calculations:

a. OG 1X resolver sin ±10 =

2 (SCM output (DVM) - 2.5V bias)

SCM input (PAVM)

= 1 (±10%)

DATE

LEM SIGNAL CONDITIONER  
JOB FUNCTIONAL CHECKOUT

JDC 12620 REV - PAGE 10 OF 10

SUBSYSTEM LEM G & N SYSTEM

ASSY

4. Perform following attitude error calculations:

a. Yaw attitude error =

2 (SCM output (DVM) - 2.5V bias)

SCM input (PAVM)

= 1 (±10%)

c. IG 1X resolver sin ±10 =

2 (SCM output (DVM) - 2.5V bias)

SCM input (PAVM)

= 1 (±10%)

b. Pitch attitude error =

2.44 (SCM output (DVM) - 2.5V bias)

SCM input (PAVM)

= 1 (±10%)

c. Roll attitude error =

2.44 (SCM output (DVM) - 2.5V bias)

SCM input (PAVM)

= 1 (±10%)

3. Perform following 1X resolver cos and sin calculations:

a. IG 1X resolver cos =

8.1 (SCM output (DVM) - 2.5V bias)

SCM input (DVM)

= 1 (±10%)

b. MG 1X resolver cos =

8.1 (SCM output (DVM) - 2.5V bias)

SCM input (DVM)

= 1 (±10%)

c. OG 1X resolver cos =

8.1 (SCM output (DVM) - 2.5V bias)

SCM input (DVM)

= 1 (±10%)

d. IG 1X resolver sin =

8.1 (SCM output (DVM) - 2.5V bias)

SCM input (DVM)

= 1 (±10%)

e. MG 1X resolver sin =

8.1 (SCM output (DVM) - 2.5V bias)

SCM input (DVM)

= 1 (±10%)

f. OG 1X resolver sin =

8.1 (SCM output (DVM) - 2.5V bias)

SCM input (DVM)

= 1 (±10%)

DATE

APOLLO G&N  
EQUIPMENT TEST

DATA SHEET 1 OF 9

JOB LEM SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

JDC NO. 12620

REV. -

INITIAL IDRR 32757

APOLLO G&N  
EQUIPMENT TEST  
DATA SHEET 1 OF 9

JOB LEM SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

TEST HISTORY

DATE START END SITE / LOCATION

TIME START END TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT

NAME SER. NO. CAL DATE

NAME SER. NO. CAL DATE

CONDUCTED BY NAME/AFFILIATION APPROVED BY NAME/AFFILIATION

JDC ITEM NO. PARAMETER UNITS MIN VALUE MAX VALUE REJ ACC

B.2 28 vdc LGC operate vdc 4.0 4.6

28 vdc IMU standby vdc 4.0 4.6

Loop closure test 1

Loop closure test 2

Loop closure test 3

Loop closure test 4

Loop closure test 5

Loop closure test 6

2.5 vdc PCM bias vdc 2.47 2.53

R&D 2.5 vdc bias vdc 2.47 2.53

120 vdc reference vdc 2.80 4.20

3200 ops 28 volt supply vdc 4.20 4.80

800 ops 28 volt supply vdc 4.20 4.80

DATE

APOLLO G&N  
EQUIPMENT TEST

DATA SHEET 2 OF 9

JOB LEM SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

JDC NO. 12620

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APOLLO G&N  
EQUIPMENT TEST  
DATA SHEET 2 OF 9

JOB LEM SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

TEST HISTORY

DATE START END SITE / LOCATION

TIME START END TOTAL ELAPSED

MAJOR GROUND SUPPORT EQUIPMENT

NAME SER. NO. CAL DATE

NAME SER. NO. CAL DATE

CONDUCTED BY NAME/AFFILIATION APPROVED BY NAME/AFFILIATION

JDC ITEM NO. PARAMETER UNITS MIN VALUE MAX VALUE REJ ACC

B.11 Cal module temperature vdc 0.40 1.28

IMU heater current (if heater is off) vdc 4.0 4.6

IMU blower current (if blower is on) vdc 4.0 4.6

PIPA temperature vdc 2.0 3.0

IRIG temperature vdc 2.37 3.70

IG servo error channel 1 v p-p

IG servo error channel 8 v p-p

MG servo error channel 2 v p-p

MG servo error channel 8 v p-p

OG servo error channel 3 v p-p

OG servo error channel 8 v p-p

DATE



SUBSYSTEM LEM G & N SYSTEM

ASSY

Table VII

Test	PSA TPA Test Points	Test Selector Panel	Signal
	High	Low	Position
a	TB4-44	TB4-48	114
b	TB4-45	TB4-49	115
c	TB4-43	TB4-47	116

74. Perform JDC 12614 to turn off G&N system.

C. CALCULATIONS

1. Perform following CDU fine error calculations:

a. IG CDU fine error =

SCM output (DYM) - 2.5V bias

2.08 x SCM input (PAVM)

= 1 (±10%)

b. MG CDU fine error =

SCM output (DYM) - 2.5V bias

2.08 x SCM input (PAVM)

= 1 (±10%)

c. OG CDU fine error =

SCM output (DYM) - 2.5V bias

2.08 x SCM input (PAVM)

= 1 (±10%)

2. Perform following 1X resolver sin ±10 degree calculations:

a. OG 1X resolver sin ±10° =

2 (SCM output (DYM) - 2.5V bias)

SCM input (PAVM)

= 1 (±10%)

DATE

SUBSYSTEM LEM G & N SYSTEM

ASSY

4. Perform following attitude error calculations:

a. Yaw attitude error =

2.44 (SCM output (DYM) - 2.5V bias)

SCM input (PAVM)

= 1 (±10%)

b. Pitch attitude error =

2.44 (SCM output (DYM) - 2.5V bias)

SCM input (PAVM)

= 1 (±10%)

c. Roll attitude error =

2.44 (SCM output (DYM) - 2.5V bias)

SCM input (PAVM)

= 1 (±10%)

5. Perform following 1X resolver cos and sin calculations:

a. IG 1X resolver cos =

8.1 (SCM output (DYM) - 2.5V bias)

SCM input (DYM)

= 1 (±10%)

b. MG 1X resolver cos =

8.1 (SCM output (DYM) - 2.5V bias)

SCM input (DYM)

= 1 (±10%)

c. OG 1X resolver cos =

8.1 (SCM output (DYM) - 2.5V bias)

SCM input (DYM)

= 1 (±10%)

d. IG 1X resolver sin =

8.1 (SCM output (DYM) - 2.5V bias)

SCM input (DYM)

= 1 (±10%)

e. MG 1X resolver sin =

8.1 (SCM output (DYM) - 2.5V bias)

SCM input (DYM)

= 1 (±10%)

f. OG 1X resolver sin =

8.1 (SCM output (DYM) - 2.5V bias)

SCM input (DYM)

= 1 (±10%)

DATE

TITLE		DATE		TEST HISTORY	
SER. NO.	DWG	REV.	END	SITE / LOCATION	TOTAL ELAPSED
MAJOR GROUND SUPPORT EQUIPMENT					
NAME		SER. NO.		CAL. DATE	
NAME		SER. NO.		CAL. DATE	
CONDUCTED BY		NAME/AFFILIATION		APPROVED BY	
NAME/AFFILIATION		NAME/AFFILIATION		NAME/AFFILIATION	

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
B.2	28 vdc LGC operate	vdc	4.0		4.6		
	28 vdc IMU standby	vdc	4.0		4.6		
B.9	Loop closure test 1						
	Loop closure test 2						
	Loop closure test 3						
	Loop closure test 4						
	Loop closure test 5						
	Loop closure test 6						
B.11	2.5 vdc PCM bias	vdc	2.47		2.53		
	R&D 2.5 vdc bias	vdc	2.47		2.53		
	120 vdc reference	vdc	2.80		4.20		
	3200 cps 28 volt supply	vdc	4.20		4.80		
	800 cps 28 volt supply	vdc	4.20		4.80		

DATE

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
B.11 (cont)	Cal module temperature	vdc	0.40		1.26		
	IMU heater current (if heater is off)	vdc	4.0		4.6		
	IMU blower current (if blower is on)	vdc	4.0		4.6		
	PIPA temperature	vdc	2.0		3.0		
	IRIG temperature	vdc	2.37		3.70		
B.23.a	IG servo error channel 1	v p-p					
	IG servo error channel 8	v p-p	channel 1 x 6/5 - 15%		channel 1 x 6/5 + 15%		
B.23.b	MG servo error channel 2	v p-p					
	MG servo error channel 8	v p-p	channel 2 x 6/5 - 15%		channel 2 x 6/5 + 15%		
B.23.c	OG servo error channel 3	v p-p					
	OG servo error channel 8	v p-p	channel 3 x 6/5 - 15%		channel 3 x 6/5 + 15%		

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APOLLO G&N  
EQUIPMENT TEST  
DATA SHEET 3 OF 9

JDC  
NO. 12320  
REV. —

JOB LEM SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ/ACC
B.32.a	IG torque motor current channel 6	mm p-p				
	IG torque motor current channel 8	mm p-p	channel 6 - 15%		channel 6 + 15%	
	MG torque motor current channel 6	mm p-p				
B.32.b	MG torque motor current channel 8	mm p-p	channel 6 - 15%		channel 6 + 15%	
	OG torque motor current channel 6	mm p-p				
	OG torque motor current channel 8	mm p-p	channel 6 - 15%		channel 6 + 15%	
B.35.a	IG CDU fine error (PAVM)	vac				
	IG CDU fine error (DVM)	vdc				
	MG CDU fine error (PAVM)	vac				
B.35.b	MG CDU fine error (DVM)	vdc				
	OG CDU fine error (PAVM)	vac				
	OG CDU fine error (DVM)	vdc				

DATE \_\_\_\_\_

APOLLO G&N  
EQUIPMENT TEST  
DATA SHEET 4 OF 9

JDC  
NO. 12620  
REV. —

JOB LEM SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ/ACC
B.40.a	OG 1X resolver sin $\pm 10^\circ$ (PAVM)	vac				
	OG 1X resolver sin $\pm 10^\circ$ (DVM)	vdc				
	MG 1X resolver sin $\pm 10^\circ$ (PAVM)	vac				
B.40.b	MG 1X resolver sin $\pm 10^\circ$ (DVM)	vdc				
	IG 1X resolver sin $\pm 10^\circ$ (PAVM)	vac				
	IG 1X resolver sin $\pm 10^\circ$ (DVM)	vdc				
B.43.a	IG 1X resolver cos (Test a)	vdc				
	IG 1X resolver cos (Test a)	vac				
	MG 1X resolver cos (Test b)	vdc				
B.43.b	MG 1X resolver cos (Test b)	vac				
	OG 1X resolver cos (Test c)	vdc				
	OG 1X resolver cos (Test c)	vac				

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APOLLO G&N  
EQUIPMENT TEST  
DATA SHEET 5 OF 9

JDC  
NO. 12620  
REV. —

JOB LEM SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ/ACC
B.43.a	IG 1X resolver sin (Test d)	vdc				
B.43.b	IG 1X resolver sin (Test d)	vac				
B.43.a	MG 1X resolver sin (Test e)	vdc				
B.43.b	MG 1X resolver sin (Test e)	vac				
B.43.a	OG 1X resolver sin (Test f)	vdc				
B.43.b	OG 1X resolver sin (Test f)	vac				
B.54	Shaft CDU fine error	vdc	2.45		2.55	
B.55	Shaft CDU fine error	vdc	3.75		4.25	
B.59	Trunnion CDU fine error	vdc	3.75		4.25	
B.60	Trunnion CDU fine error	vdc	2.45		2.55	
B.64	Trunnion 1X resolver sin	vdc	4.45		4.95	
	Trunnion 1X resolver cos	vdc	4.45		4.95	

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APOLLO G&N  
EQUIPMENT TEST  
DATA SHEET 6 OF 9

JDC  
NO. 12620  
REV. —

JOB LEM SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ/ACC
B.66	Shaft 1X resolver sin	vdc	4.45		4.95	
	Shaft 1X resolver cos	vdc	4.45		4.95	
B.73.a	Yaw attitude error (PAVM)	vac				
	Yaw attitude error (DVM)	vdc				
B.73.b	Pitch attitude error (PAVM)	vac				
	Pitch attitude error (DVM)	vdc				
B.73.c	Roll attitude error (PAVM)	vac				
	Roll attitude error (DVM)	vdc				

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APOLLO 68N  
EQUIPMENT TEST  
DATA SHEET 3 OF 9

JDC  
NO. 12620  
REV. -

JOB LEM SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ. ACC
B.32.a	IG torque motor current channel 6	mm p-p				
	IG torque motor current channel 8	mm p-p	channel 6 - 15%		channel 6 + 15%	
	MG torque motor current channel 6	mm p-p				
B.32.b	MG torque motor current channel 8	mm p-p	channel 6 - 15%		channel 6 + 15%	
	OG torque motor current channel 6	mm p-p				
	OG torque motor current channel 8	mm p-p	channel 6 - 15%		channel 6 + 15%	
B.32.c	IG torque motor current channel 6	mm p-p				
	OG torque motor current channel 8	mm p-p	channel 6 - 15%		channel 6 + 15%	
B.35.a	IG CDU fine error (PAVM)	vac				
	IG CDU fine error (DVM)	vdc				
B.35.b	MG CDU fine error (PAVM)	vac				
	MG CDU fine error (DVM)	vdc				
B.35.c	OG CDU fine error (PAVM)	vac				
	OG CDU fine error (DVM)	vdc				

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APOLLO 68N  
EQUIPMENT TEST  
DATA SHEET 4 OF 9

JDC  
NO. 12620  
REV. -

JOB LEM SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ. ACC
B.40.a	OG 1X resolver sin $\pm 10^\circ$ (PAVM)	vac				
	OG 1X resolver sin $\pm 10^\circ$ (DVM)	vdc				
B.40.b	MG 1X resolver sin $\pm 10^\circ$ (PAVM)	vac				
	MG 1X resolver sin $\pm 10^\circ$ (DVM)	vdc				
B.40.c	IG 1X resolver sin $\pm 10^\circ$ (PAVM)	vac				
	IG 1X resolver sin $\pm 10^\circ$ (DVM)	vdc				
B.43.a	IG 1X resolver cos (Test a)	vdc				
	IG 1X resolver cos (Test a)	vac				
B.43.b	MG 1X resolver cos (Test b)	vdc				
	MG 1X resolver cos (Test b)	vac				
B.43.c	OG 1X resolver cos (Test c)	vdc				
	OG 1X resolver cos (Test c)	vac				

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JDC  
NO. 12620  
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JOB LEM SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ. ACC
B.43.a	IG 1X resolver sin (Test d)	vdc				
B.43.b	IG 1X resolver sin (Test d)	vac				
B.43.a	MG 1X resolver sin (Test e)	vdc				
B.43.b	MG 1X resolver sin (Test e)	vac				
B.43.a	OG 1X resolver sin (Test f)	vdc				
B.43.b	OG 1X resolver sin (Test f)	vac				
B.54	Shaft CDU fine error	vdc	2.45		2.55	
B.55	Shaft CDU fine error	vdc	3.75		4.25	
B.59	Trunion CDU fine error	vdc	3.75		4.25	
B.60	Trunion CDU fine error	vdc	2.45		2.55	
B.64	Trunion 1X resolver sin	vdc	4.45		4.95	
	Trunion 1X resolver cos	vdc	4.45		4.95	

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DATA SHEET 6 OF 9

JDC  
NO. 12620  
REV. -

JOB LEM SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ. ACC
B.66	Shaft 1X resolver sin	vdc	4.45		4.95	
	Shaft 1X resolver cos	vdc	4.45		4.95	
B.73.a	Yaw attitude error (PAVM)	vac				
	Yaw attitude error (DVM)	vdc				
B.73.b	Pitch attitude error (PAVM)	vac				
	Pitch attitude error (DVM)	vdc				
B.73.c	Roll attitude error (PAVM)	vac				
	Roll attitude error (DVM)	vdc				

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APOLLO GBN  
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JOB LEM SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

JDC  
NO. 12620  
REV. --

CALCULATIONS

$$\text{IG CDU fine error} = \frac{\text{SCM output (DVM)} - 2.5\text{V bias}}{2.08 \times \text{SCM input (PAVM)}} = 1 (\pm 10\%)$$

$$\text{MG CDU fine error} = \frac{\text{SCM output (DVM)} - 2.5\text{V bias}}{2.08 \times \text{SCM input (PAVM)}} = 1 (\pm 10\%)$$

$$\text{OG CDU fine error} = \frac{\text{SCM output (DVM)} - 2.5\text{V bias}}{2.08 \times \text{SCM input (PAVM)}} = 1 (\pm 10\%)$$

$$\text{OG IX resolver sin } \pm 10^\circ = \frac{2 (\text{SCM output (DVM)} - 2.5\text{V bias})}{\text{SCM input (PAVM)}} = 1 (\pm 10\%)$$

$$\text{MG IX resolver sin } \pm 10^\circ = \frac{2 (\text{SCM output (DVM)} - 2.5\text{V bias})}{\text{SCM input (PAVM)}} = 1 (\pm 10\%)$$

DATE

APOLLO GBN  
EQUIPMENT TEST  
DATA SHEET 8 OF 9  
JOB LEM SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

JDC  
NO. 12620  
REV. --

CALCULATIONS

$$\text{IG IX resolver sin } \pm 10^\circ = \frac{2 (\text{SCM output (DVM)} - 2.5\text{V bias})}{\text{SCM input (PAVM)}} = 1 (\pm 10\%)$$

$$\text{IG IX resolver cos} = \frac{2.1 (\text{SCM output (DVM)} - 2.5\text{V bias})}{\text{SCM input (DVM)}} = 1 (\pm 10\%)$$

$$\text{MG IX resolver cos} = \frac{2.1 (\text{SCM output (DVM)} - 2.5\text{V bias})}{\text{SCM input (DVM)}} = 1 (\pm 10\%)$$

$$\text{OG IX resolver cos} = \frac{2.1 (\text{SCM output (DVM)} - 2.5\text{V bias})}{\text{SCM input (DVM)}} = 1 (\pm 10\%)$$

$$\text{IG IX resolver sin} = \frac{2.1 (\text{SCM output (DVM)} - 2.5\text{V bias})}{\text{SCM input (DVM)}} = 1 (\pm 10\%)$$

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APOLLO GBN  
EQUIPMENT TEST  
DATA SHEET 9 OF 9  
JOB LEM SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

JDC  
NO. 12620  
REV. --

CALCULATIONS

$$\text{MG IX resolver sin} = \frac{2.1 (\text{SCM output (DVM)} - 2.5\text{V bias})}{\text{SCM input (DVM)}} = 1 (\pm 10\%)$$

$$\text{OG IX resolver sin} = \frac{2.1 (\text{SCM output (DVM)} - 2.5\text{V bias})}{\text{SCM input (DVM)}} = 1 (\pm 10\%)$$

$$\text{Yaw attitude error} = \frac{2.44 (\text{SCM output (DVM)} - 2.5\text{V bias})}{\text{SCM input (PAVM)}} = 1 (\pm 10\%)$$

$$\text{Pitch attitude error} = \frac{2.44 (\text{SCM output (DVM)} - 2.5\text{V bias})}{\text{SCM input (PAVM)}} = 1 (\pm 10\%)$$

$$\text{Roll attitude error} = \frac{2.44 (\text{SCM output (DVM)} - 2.5\text{V bias})}{\text{SCM input (PAVM)}} = 1 (\pm 10\%)$$

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APOLLO 68N  
EQUIPMENT TEST  
DATA SHEET 7 OF 9  
JOB LEM SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

JDC  
NO. 12620  
REV. -

CALCULATIONS

$$IG\ CDU\ fine\ error = \frac{SCM\ output\ (DVM) - 2.5V\ bias}{2.08 \times SCM\ input\ (PAVM)} = 1 (\pm 10\%)$$

$$MG\ CDU\ fine\ error = \frac{SCM\ output\ (DVM) - 2.5V\ bias}{2.08 \times SCM\ input\ (PAVM)} = 1 (\pm 10\%)$$

$$OG\ CDU\ fine\ error = \frac{SCM\ output\ (DVM) - 2.5V\ bias}{2.08 \times SCM\ input\ (PAVM)} = 1 (\pm 10\%)$$

$$OG\ LX\ resolver\ sin\ \pm 10^\circ = \frac{2\ (SCM\ output\ (DVM) - 2.5V\ bias)}{SCM\ input\ (PAVM)} = 1 (\pm 10\%)$$

$$MG\ LX\ resolver\ sin\ \pm 10^\circ = \frac{2\ (SCM\ output\ (DVM) - 2.5V\ bias)}{SCM\ input\ (PAVM)} = 1 (\pm 10\%)$$

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APOLLO 68N  
EQUIPMENT TEST  
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JOB LEM SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

JDC  
NO. 12620  
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CALCULATIONS

$$IG\ LX\ resolver\ cos\ \pm 10^\circ = \frac{2\ (SCM\ output\ (DVM) - 2.5V\ bias)}{SCM\ input\ (PAVM)} = 1 (\pm 10\%)$$

$$MG\ LX\ resolver\ cos = \frac{2.1\ (SCM\ output\ (DVM) - 2.5V\ bias)}{SCM\ input\ (DVM)} = 1 (\pm 10\%)$$

$$MG\ LX\ resolver\ cos = \frac{2.1\ (SCM\ output\ (DVM) - 2.5V\ bias)}{SCM\ input\ (DVM)} = 1 (\pm 10\%)$$

$$OG\ LX\ resolver\ cos = \frac{2.1\ (SCM\ output\ (DVM) - 2.5V\ bias)}{SCM\ input\ (DVM)} = 1 (\pm 10\%)$$

$$MG\ LX\ resolver\ sin = \frac{2.1\ (SCM\ output\ (DVM) - 2.5V\ bias)}{SCM\ input\ (DVM)} = 1 (\pm 10\%)$$

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APOLLO 68N  
EQUIPMENT TEST  
DATA SHEET 9 OF 9  
JOB LEM SIGNAL CONDITIONER FUNCTIONAL CHECKOUT

JDC  
NO. 12620  
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CALCULATIONS

$$MG\ LX\ resolver\ sin = \frac{2.1\ (SCM\ output\ (DVM) - 2.5V\ bias)}{SCM\ input\ (DVM)} = 1 (\pm 10\%)$$

$$OG\ LX\ resolver\ sin = \frac{2.1\ (SCM\ output\ (DVM) - 2.5V\ bias)}{SCM\ input\ (DVM)} = 1 (\pm 10\%)$$

$$Yaw\ attitude\ error = \frac{2.44\ (SCM\ output\ (DVM) - 2.5V\ bias)}{SCM\ input\ (PAVM)} = 1 (\pm 10\%)$$

$$Pitch\ attitude\ error = \frac{2.44\ (SCM\ output\ (DVM) - 2.5V\ bias)}{SCM\ input\ (PAVM)} = 1 (\pm 10\%)$$

$$Roll\ attitude\ error = \frac{2.44\ (SCM\ output\ (DVM) - 2.5V\ bias)}{SCM\ input\ (PAVM)} = 1 (\pm 10\%)$$

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SUBSYSTEM	LEM G & N SYSTEM	ASSY
	measure and record the oscilloscope indications of A through F. (See Figure 1.)	38. Enter VERB 33 and press the ENTR pushbutton on the DSKY. Record the Frequency Counter indications.
	LR RANGE GATE STROBE TIMING TEST	LR VZ GATE STROBE TIMING TEST
	32. Set the CHANNEL S switches to 118 (LR RESET STROBE).	39. Set the CHANNEL S switches to 118. Set XY INTERFACE switch to S-T and scope mode switch to ALT.
	33. Connect a coax to SCOPE B jack and B input jack on the oscilloscope. Set XY Interface Scope SW to S-T and Scope Mode to ALT. switch.	40. Determine and record the Timing lag of a LR VZ Gate Strobe pulse (T-219) to a LR Reset Strobe pulse (S-118) at their respective A/2 points.
	34. Determine the timing lag of a LR Range Gate Strobe pulse (T-220) to a LR Reset Strobe pulse (S-118) at their respective A/2 points.	LR VZ GATE STROBE TEST
	LR SYNC FOR READOUT STROBE TEST	41. Measure and record the oscilloscope indications of A through F. (See Figure 1.)
	35. Set the CHANNEL S switches to 314 (LR SYNC FOR READOUT). Set XY Interface Scope switch to S and scope mode to A-B. Measure and record the oscilloscope indications of A through F. (See Figure 1.)	LR VZ DATA ACQUISITION TEST
	LR RANGE DATA ACQUISITION TEST	42. Perform the following DSKY operations:
	36. Perform the following DSKY operations:	a. VERB 14 NOUN 01 ENTR
	a. VERB 14 NOUN 01 ENTR	b. Address of V <sub>Z</sub> data 03437 ENTR
	b. Address of LR Range data 03437 ENTR	c. Observe Row 1 Indicates 00001
	c. Observe Row 1 Indicates 00011	d. Observe Row 2 Indicates 10437
	d. Observe Row 2 Indicates 37653	LR VY READ CYCLE TIMING TEST
	READ CYCLE TIMING TEST LR VZ	43. Reset the Frequency Counter. Set the CHANNEL T switches to 218 (LR VY GATE STROBE) and CHANNEL S switches to 314.
	37. Reset the Frequency Counter. Set the CHANNEL T switches to 219 (LR ZA GATE STROBE).	44. Enter VERB 33 and press the ENTR pushbutton on the DSKY. Record the Frequency Counter indication.

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SUBSYSTEM	LEM G & N SYSTEM	ASSY
	LR VY GATE STROBE TIMING TEST	LR V <sub>X</sub> GATE STROBE TEST
	45. Set the CHANNEL S switches to 118. 46. Determine and record the timing lag of a LR YA Gate Strobe pulse (T-118) at their respective A/2 points.	53. Measure and record the oscilloscope indications of A through F. (See Figure 1.)
	LR VY GATE STROBE TEST	LR V <sub>X</sub> DATA ACQUISITION TEST
	47. Measure and record the oscilloscope indications of A through F. (See Figure 1.)	54. Perform the following DSKY operations:
	LR VY DATA ACQUISITION TEST	a. VERB 14 NOUN 01 ENTR
	48. Perform the following DSKY operations:	b. Address of X <sub>A</sub> Row 1 indicated 00001
	a. VERB 14 NOUN 01 ENTR	c. Observe Row 1 Indicates 10437
	b. Address of V <sub>Y</sub> Row 1 Indicates 00001	d. Observe Row 2 Indicates 10437
	c. Observe Row 1 Indicates 00001	RR RANGE RATE READ CYCLE TIMING TEST
	d. Observe Row 2 Indicates 10437	55. Reset the Frequency Counter. Set the CHANNEL T switches to 216 (RR RANGE RATE STROBE) and the CHANNEL S switches to 313.
	LR V <sub>X</sub> READ CYCLE TIMING TEST	56. Enter VERB 33 and press the ENTR pushbutton on the DSKY. Record the Frequency Counter indications.
	49. Reset the Frequency Counter. Set the CHANNEL T switches to 217 (LR V <sub>X</sub> GATE STROBE) and CHANNEL S switches to 314.	RR RANGE RATE GATE STROBE TIMING TEST
	50. Enter VERB 33 and press the ENTR pushbutton on the DSKY. Record the Frequency Counter indication.	57. Set the CHANNEL S switches to 105.
	LR V <sub>X</sub> GATE STROBE TIMING TEST	58. Determine and record the timing lag of a RR Range Rate Gate Strobe pulse (T216) to a RR Reset Strobe pulse (S-105) at their respective A/2 points.
	51. Set the CHANNEL S switches to 118. 52. Determine and record the timing lag of a LR V <sub>X</sub> Gate Strobe pulse (T-217) to a LR Reset Strobe pulse (S-116) at their respective A/2 points.	RR RANGE RATE GATE STROBE TEST
	53. Measure and record the oscilloscope indications of A through F. (See Figure 1.)	59. Measure and record the oscilloscope indications of A through F. (See Figure 1.)

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SUBSYSTEM	LEM G & N SYSTEM	ASSY
	RR RANGE RATE DATA ACQUISITION TEST	
	60. Perform the following DSKY operations:	a. VERB 14 NOUN 01 ENTR
	a. VERB 14 NOUN 01 ENTR	b. Address of RR Range data 03437 ENTR
	b. Address of RR Range data 03437 ENTR	c. Observe Row 1 Indicates 00017
	c. Observe Row 1 Indicates 77777	d. Observe Row 2 Indicates 37770
	d. Observe Row 2 Indicates 36627	68. Deactivate all switches on the XY Interface Panel. Enter VERB 36 and press the ENTR pushbutton on the DSKY.
	RR RANGE READ CYCLE TIMING TEST	DOWN LINK TELEMETRY TEST
	61. Reset the Frequency Counter. Set the CHANNEL T switches to 215 (RR RANGE GATE STROBE) and the CHANNEL S switches to 313 (RR SYNC FOR READOUT).	69. Perform the following DSKY operations:
	62. Enter VERB 33 and press the ENTR pushbutton on the DSKY. Record the Frequency Counter indication.	a. VERB 21 NOUN 01 ENTR
	RR SYNC FOR READOUT STROBE TEST	b. 01750 ENTR
	63. Measure and record the oscilloscope indications of A through F. (See Figure 1.)	c. 11753 ENTR
	RR RANGE GATE STROBE TIMING TEST	d. NOUN 15 ENTR
	64. Set the CHANNEL S switches to 105. 65. Determine and record the timing lag of a RR Range Gate Strobe pulse (T-215) to a RR Reset Strobe pulse (S-105) at their respective A/2 points.	e. 01755 ENTR
	RR RANGE GATE STROBE TEST	f. 04353 ENTR
	66. Measure and record the oscilloscope indications of A through F. (See Figure 1.)	g. 00100 ENTR
	RR RANGE DATA ACQUISITION TEST	h. 77777 ENTR
	67. Perform the following DSKY operations:	i. 55753 ENTR
	a. VERB 14 NOUN 01 ENTR	j. 31754 ENTR
	b. 00033 ENTR	k. 55000 ENTR
	c. Observe Row 1 Indicates X3XXX	l. 25757 ENTR
	76. Press the DL ENABLE pushbutton. Set the CHANNEL S and T switches to 101. Press the WORD RATE 300 PPS pushbutton, the pushbutton shall go out.	m. 01750 ENTR
	75. Perform the following DSKY operations:	n. NOUN 01 ENTR
	a. VERB 01 NOUN 10 ENTR	o. 00411 ENTR
	b. 00033 ENTR	p. 01000 ENTR
	c. Observe Row 1 Indicates X3XXX	q. VERB 25 NOUN 26 ENTR
	76. Press the DL ENABLE pushbutton. Set the CHANNEL S and T switches to 101. Press the WORD RATE 300 PPS pushbutton, the pushbutton shall go out.	r. 04000 ENTR
	75. Perform the following DSKY operations:	s. 01750 ENTR
	a. VERB 01 NOUN 10 ENTR	t. 00003 ENTR
	b. 00033 ENTR	
	c. Observe Row 1 Indicates X3XXX	
	76. Press the DL ENABLE pushbutton. Set the CHANNEL S and T switches to 101. Press the WORD RATE 300 PPS pushbutton, the pushbutton shall go out.	

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SUBSYSTEM	LEM G & N SYSTEM	ASSY
	u. VERB 30 ENTR	74. Press the WORD RATE 300 PPS pushbutton, the pushbutton shall light. Press the WORD RATE 10 PPS pushbutton, the pushbutton shall go out.
	v. VERB 01 NOUN 01 ENTR	NOTE: The PROG alarm on the DSKY shall light.
	w. 01000 ENTR	75. Perform the following DSKY operations:
	x. Observe Row 1 Indicates 77777	a. VERB 01 NOUN 10 ENTR
	y. NOUN 01 ENTR	b. 00033 ENTR
	z. 01077 ENTR	c. Observe Row 1 Indicates X3XXX
	aa. Observe Row 1 Indicates 77777	76. Press the DL ENABLE pushbutton. Set the CHANNEL S and T switches to 101. Press the WORD RATE 300 PPS pushbutton, the pushbutton shall go out.
	bb. Observe Row 1 does not indicate 77777, repeat step 69.	
	70. Make the following switch settings on the XY Interface Panel:	
	a. DL ENABLE pushbutton - press	
	b. WORD RATE 50 PPS pushbutton - press to light	
	c. Set scope mode switch to B. Press 200 OHM LOAD button for CHANNEL S and CHANNEL T.	
	d. SCOPE switch to S-T	
	71. Set the CHANNEL T switches to 102 (DLNK DATA). Measure and record the oscilloscope indications of A through E. (See Figure 1.)	
	72. Set the SCOPE switch to S-T and the CHANNEL S switches to 307 (DLNK SYNC). Set scope mode switch to ALT. Measure and record the delay of the DLNK DATA pulse with respect to the DLNK SYNC pulse.	
	73. Press the WORD RATE 10 PPS pushbutton, the pushbutton shall light. Press the WORD RATE 50 PPS pushbutton, the pushbutton shall go out. Adjust the oscilloscope and repeat step 71.	

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SUBSYSTEM	LEM G & N SYSTEM	ASSY
	NOTE: Disregard the PROG and TRACKER alarms during the following test.	
	30. Make the following switch settings on the AGC INPUT COUNTERS portion of the XY Interface Panel:	
	a. Selector to 12	
	b. STANDARD RATE pushbutton - press to light	
	c. POSITIVE pushbutton - press to light	
	d. OUT IN pushbutton - press to light	
	e. Set C33-4, C33-5, C33-8 on RDC Panel.	
	f. Press CHANNEL S 510 OHM button and CHANNEL T 510 OHM button.	
	LR RANGE GATE STROBE TEST	
	31. Press VERB 57 ENTR, 00014 ENTR, VERB 33 ENTR. Adjust the oscilloscope and measure and record the oscilloscope indications of A through F. (See Figure 1.)	
	LR RANGE GATE STROBE TIMING TEST	
	32. Set the CHANNEL S switches to 118 (LR RESET STROBE).	

SUBSYSTEM	LEM G & N SYSTEM	ASSY
	33. Connect a coax to SCOPE B Jack and B input jack on the oscilloscope. Set XY Interface Scope SW to S-F and Scope Mode to ALT. switch.	
	34. Determine the timing lag of a LR Range Gate Strobe pulse (T-220) to a LR Reset Strobe pulse (S-118) at their respective A/2 points.	
	LR SYNC FOR READOUT STROBE TEST	
	35. Set the CHANNEL S switches to 314 (LR SYNC FOR READOUT). Set XY Interface Scope switch to S and scope mode to A+B. Measure and record the oscilloscope indications of A through F. (See Figure 1.)	
	LR RANGE DATA ACQUISITION TEST	
	36. Perform the following DSKY operations:	
	a. VERB 14 NOUN 01 ENTR	
	b. Address of LR Range data 03437 ENTR	
	c. Observe Row 1 indicates 00011	
	d. Observe Row 2 indicates 37653	
	READ CYCLE TIMING TEST LR V <sub>Z</sub>	
	DATE _____	

SUBSYSTEM	LEM G & N SYSTEM	ASSY
	d. Observe Row 2 indicates 10437	
	LR V <sub>X</sub> READ CYCLE TIMING TEST	
	49. Reset the Frequency Counter. Set the CHANNEL T switches to 217 (LR V <sub>X</sub> GATE STROBE) and CHANNEL S switches to 314.	
	50. Enter VERB 33 and press the ENTR pushbutton on the DSKY. Record the Frequency Counter indication.	
	LR V <sub>X</sub> GATE STROBE TIMING TEST	
	51. Set the CHANNEL S switches to 118.	
	52. Determine and record the timing lag of a LR V <sub>X</sub> Gate Strobe pulse (T-217) to a LR Reset Strobe pulse (S-116) at their respective A/2 points.	
	LR V <sub>X</sub> GATE STROBE TEST	
	53. Measure and record the oscilloscope indications of A through F. (See Figure 1.)	
	LR V <sub>X</sub> DATA ACQUISITION TEST	
	54. Perform the following DSKY operations:	
	a. VERB 14 NOUN 01 ENTR	
	b. Address of X <sub>A</sub> data 03437 ENTR	
	c. Observe Row 1 indicates 00001	
	DATE _____	

SUBSYSTEM	LEM G & N SYSTEM	ASSY
	d. Observe Row 2 indicates 36627	
	RR RANGE READ CYCLE TIMING TEST	
	61. Reset the Frequency Counter. Set the CHANNEL T switches to 215 (RR RANGE GATE STROBE) and the CHANNEL S switches to 313 (RR SYNC FOR READOUT).	
	62. Enter VERB 33 and press the ENTR pushbutton on the DSKY. Record the Frequency Counter indication.	
	RR SYNC FOR READOUT STROBE TEST	
	63. Measure and record the oscilloscope indications of A through F. (See Figure 1.)	
	RR RANGE GATE STROBE TIMING TEST	
	64. Set the CHANNEL S switches to 105.	
	65. Determine and record the timing lag of a RR Range Gate Strobe pulse (T-215) to a RR Reset Strobe pulse (S-105) at their respective A/2 points.	
	RR RANGE RATE GATE STROBE TEST	
	59. Measure and record the oscilloscope indications of A through F. (See Figure 1.)	
	RR RANGE RATE DATA ACQUISITION TEST	
	60. Perform the following DSKY operations:	
	a. VERB 14 NOUN 01 ENTR	
	b. Address of RR Range data 03437 ENTR	
	c. Observe Row 1 indicates 7177	
	DATE _____	

SUBSYSTEM	LEM G & N SYSTEM	ASSY
	b. Address of RR Range data 03437 ENTR	
	c. Observe Row 1 indicates 00017	
	d. Observe Row 2 indicates 37770	
	68. Deactivate all switches on the XY Interface Panel. Enter VERB 36 and press the ENTR pushbutton on the DSKY.	
	DOWN LINK TELEMETRY TEST	
	69. Perform the following DSKY operations:	
	a. VERB 21 NOUN 01 ENTR	
	b. 01750 ENTR	
	c. 11753 ENTR	
	d. NOUN 15 ENTR	
	e. 01755 ENTR	
	f. 04353 ENTR	
	g. 00100 ENTR	
	h. 71777 ENTR	
	i. 55753 ENTR	
	j. 31754 ENTR	
	k. 55000 ENTR	
	l. 25757 ENTR	
	m. 01750 ENTR	
	DATE _____	



APOLLO G&N  
EQUIPMENT TEST  
DATA SHEET 1 OF 6

JDC  
NO. 12621  
REV. A  
INITIAL TDRR 27134

JOB LGC OUTPUT TEST

ASSEMBLY UNDER TEST		TEST HISTORY	
TITLE	DATE	START	END
SER. NO.	DWG	REV.	SITE / LOCATION
MAJOR GROUND SUPPORT EQUIPMENT		END	TOTAL ELAPSED
NAME	SER. NO.	SER. NO.	CAL DATE
NAME	SER. NO.	SER. NO.	CAL DATE

CONDUCTED BY NAME/AFFILIATION APPROVED BY NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ ACC
4.a	RCS Jet -X4U	vdv	2.0		5.0	
4.b	RCS Jet +X4D	vdv	2.0		5.0	
4.c	REC Jet -X3U	vdv	2.0		5.0	
4.d	RCS Jet +X3D	vdv	2.0		5.0	
4.e	RCS Jet -X2U	vdv	2.0		5.0	
4.f	RCS Jet +X2D	vdv	2.0		5.0	
4.g	RCS Jet -X1U	vdv	2.0		5.0	
4.h	RCS Jet +X1D	vdv	2.0		5.0	
6	RCS Jet -X4U	vdv	9.0		11.0	
	RCS Jet +X4D	vdv	9.0		11.0	
	RCS Jet -X3U	vdv	9.0		11.0	
	RCS Jet +X3D	vdv	9.0		11.0	
	RCS Jet -X2U	vdv	9.0		11.0	
	RCS Jet +X2D	vdv	9.0		11.0	
	RCS Jet -X1U	vdv	9.0		11.0	
	RCS Jet +X1D	vdv	9.0		11.0	
7.u	RCS Jet +Z3F	vdv	2.0		5.0	
7.b	RCS Jet -Z4F	vdv	2.0		5.0	

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APOLLO G&N  
EQUIPMENT TEST  
DATA SHEET 2 OF 6

JDC  
NO. 12621  
REV. A

JOB LGC OUTPUT TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ ACC
7.c	RCS Jet -Z1F	vdv	2.0		5.0	
7.d	RCS Jet +Z2F	vdv	2.0		5.0	
7.e	RCS Jet +Y2S	vdv	2.0		5.0	
7.f	RCS Jet -Y3S	vdv	2.0		5.0	
7.g	RCS Jet -Y4S	vdv	2.0		5.0	
7.h	RCS Jet -Y1s	vdv	2.0		5.0	
9	RCS Jet +Z3F	vdv	9.0		11.0	
	RCS Jet -Z4F	vdv	9.0		11.0	
	RCS Jet -Z1F	vdv	9.0		11.0	
	RCS Jet +Z2F	vdv	9.0		11.0	
	RCS Jet +Y2s	vdv	9.0		11.0	
	RCS Jet -Y3S	vdv	9.0		11.0	
	RCS Jet -Y4S	vdv	9.0		11.0	
	RCS Jet -Y1s	vdv	9.0		11.0	
10	Eng On	vdv	2.0		5.0	
	Eng Off	vdv	2.0		5.0	
12	Eng On	vdv	9.0		11.0	
	Eng Off	vdv	9.0		11.0	
13.a	Pitch Gimbal Trim	vdv	2.0		5.0	
13.b	Pitch Gimbal Trim	vdv	2.0		5.0	
13.c	Roll Gimbal Trim	vdv	2.0		5.0	
13.d	Roll Gimbal Trim	vdv	2.0		5.0	
16	Pitch Gimbal Trim	vdv	9.0		11.0	
	Pitch Gimbal Trim	vdv	9.0		11.0	
	Roll Gimbal Trim	vdv	9.0		11.0	
	Roll Gimbal Trim	vdv	9.0		11.0	
18A	Amplitude	volts	4.0		10.0	

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APOLLO G&N  
EQUIPMENT TEST  
DATA SHEET 3 OF 6

JDC  
NO. 12621  
REV. A

JOB LGC OUTPUT TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ ACC
18B	Pulse Width	u sec	2.0		4.0	
18C	Droop	volts			A/5	
18D	Rise Time	u sec			0.20	
18E	Backsawing	volts			4.0	
18F	Noise	P-PV	0		0.4	
20A	Amplitude	volts	4.0		10.0	
20B	Pulse Width	u sec	2.0		4.0	
20C	Droop	volts			A/5	
20D	Rise Time	u sec			0.20	
20E	Backsawing	volts			4.0	
20F	Noise	P-PV	0		0.4	
22.a.A	Amplitude	volts	4.0		10.0	
22.a.B	Pulse Width	u sec	2.0		4.0	
22.a.C	Droop	volts			A/5	
22.a.D	Rise Time	u sec			0.2	
22.a.E	Backsawing	volts			4.0	
22.b.A	Amplitude	volts	4.0		10.0	
22.b.B	Pulse Width	u sec	2.0		4.0	
22.b.C	Droop	volts			A/5	
22.b.D	Rise Time	u sec			0.2	
22.b.E	Backsawing	volts			4.0	
24.a.A	Amplitude	volts	4.0		10.0	
24.a.B	Pulse Width	u sec	2.0		4.0	
24.a.C	Droop	volts			A/5	
24.a.D	Rise Time	u sec			0.2	
24.a.E	Backsawing	volts			4.0	
24.b.A	Amplitude	volts	4.0		10.0	
24.b.B	Pulse Width	u sec	2.0		4.0	

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APOLLO G&N  
EQUIPMENT TEST  
DATA SHEET 4 OF 6

JDC  
NO. 12621  
REV. A

JOB LGC OUTPUT TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ ACC
24.b.C	Droop	volts			A/5	
24.b.D	Rise Time	u sec			.2	
24.b.E	Backsawing	volts			4.0	
26.a.A	Amplitude	volts	4.0		10.0	
26.a.B	Pulse Width	u sec	2.0		4.0	
26.a.C	Droop	volts			A/5	
26.a.D	Rise Time	u sec			.2	
26.a.E	Backsawing	volts			4.0	
26.a.F	Noise	volts	0		.4	
26.b.A	Amplitude	volts	4.0		10.0	
26.b.B	Pulse Width	u sec	2.0		4.0	
26.b.C	Droop	volts			A/5	
26.b.D	Rise Time	u sec			.2	
26.b.E	Backsawing	volts			4.0	
26.b.F	Noise	volts	0		.4	
31.A	Amplitude	volts	4.0		10.0	
47.A	Amplitude	volts	4.0		10.0	
47.B	Pulse Width	u sec	2.0		4.0	
47.C	Droop	volts			A.5	
47.D	Rise Time	u sec			.20	
47.E	Backsawing	volts			4.0	
47.F	Noise	volts	0		0.4	
50	LR Vx Read	u sec	80.935			
	Cycle Timing					
52	LR Vx Gate	u sec	1.75		2.25	
53.A	Amplitude	volts	4.0		10.0	

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SUBSYSTEM LEM G &amp; N SYSTEM ASSY

- n. NOUN 01 ENTER d. SCOPE switch to S-T
- o. 00411 ENTER 71. Set the CHANNEL T switches to 102 (DLNK DATA). Measure and record the oscilloscope indications of A through E. (See Figure 1.)
- p. 01000 ENTER
- q. VERB 25 NOUN 26 ENTER
- r. 04000 ENTER
- s. 01750 ENTER 72. Set the SCOPE switch to S-T and tie CHANNEL S switches to 307 (DLNK SYNC). Set scope mode switch to ALT. Measure and record the delay of the DLNK DATA pulse with respect to the DLNK SYNC pulse.
- t. 00003 ENTER
- u. VERB 30 ENTER
- v. VERB 01 NOUN 01 ENTER
- v. 01000 ENTER
- x. Observe 73. Press the WORD RATE 10 PPS pushbutton, Row 1 indicates TTTTT
- y. NOUN 01 ENTER the pushbutton shall light. Press the WORD RATE 50 PPS pushbutton, the pushbutton shall go out. Adjust the oscilloscope and repeat step 71.
- z. 01077
- aa. Observe 74. Press the WORD RATE 300 PPS pushbutton, Row 1 indicates TTTTT repeat the pushbutton shall light. Press the WORD RATE 10 PPS pushbutton, the pushbutton shall go out.

If Row 1 does not indicate TTTT, repeat step 69.

70. Make the following switch settings on the XY Interface Panel:

- a. DL ENABLE pushbutton - press
- b. WORD RATE 50 PPS pushbutton - press to light
- c. Set scope mode switch to B. Press 200 OHM LOAD button for CHANNEL S and CHANNEL T.

DATE \_\_\_\_\_

SUBSYSTEM LEM G &amp; N SYSTEM ASSY

- c. Observe Row 1 indicates X3XXX
76. Press the DL ENABLE pushbutton. Set the CHANNEL S and T switches to 101. Press the WORD RATE 300 PPS pushbutton, the pushbutton shall go out.

DATE \_\_\_\_\_

APOLLO G&N  
EQUIPMENT TEST  
DATA SHEET 1 OF

JOB \_\_\_\_\_

ASSEMBLY UNDER TEST			TEST HISTORY		
TITLE	DATE	START	END	SITE / LOCATION	
SER. NO.	DWG	REV	TIME	START	END
MAJOR GROUND SUPPORT EQUIPMENT					
NAME	SER. NO.	CAL DATE			
NAME	SER. NO.	CAL DATE			
CONDUCTED BY _____ APPROVED BY _____ NAME / AFFILIATION _____					
JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE
6	RCS Jet -X1U	vdc	2.0		5.0
	RCS Jet -X1D	vdc	2.0		5.0
	RCS Jet -X3U	vdc	2.0		5.0
	RCS Jet -X3D	vdc	2.0		5.0
	RCS Jet -X2U	vdc	2.0		5.0
	RCS Jet -X2D	vdc	2.0		5.0
	RCS Jet -X1U	vdc	2.0		5.0
	RCS Jet -X1D	vdc	2.0		5.0
	RCS Jet -X1U	vdc	9.0		11.0
	RCS Jet -X1D	vdc	9.0		11.0
	RCS Jet -X3U	vdc	9.0		11.0
	RCS Jet -X3D	vdc	9.0		11.0
	RCS Jet -X2U	vdc	9.0		11.0
	RCS Jet -X2D	vdc	9.0		11.0

DATE \_\_\_\_\_

APOLLO G&N  
EQUIPMENT TEST  
DATA SHEET 2 OF

JOB \_\_\_\_\_

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ ACC
	RCS Jet -X1U	vdc	9.0		11.0	
	RCS Jet -X1D	vdc	9.0		11.0	
7.a	RCS Jet -X23F	vdc	2.0		5.0	
7.b	RCS Jet -X24F	vdc	2.0		5.0	
7.c	RCS Jet -X21F	vdc	2.0		5.0	
7.d	RCS Jet -X22F	vdc	2.0		5.0	
7.e	RCS Jet -X28F	vdc	2.0		5.0	
7.f	RCS Jet -X38F	vdc	2.0		5.0	
7.g	RCS Jet -X48F	vdc	2.0		5.0	
7.h	RCS Jet -X11a	vdc	2.0		5.0	
9	RCS Jet -X3F	vdc	9.0		11.0	
	RCS Jet -X24F	vdc	9.0		11.0	
	RCS Jet -X21F	vdc	9.0		11.0	
	RCS Jet -X22F	vdc	9.0		11.0	
	RCS Jet -X28a	vdc	9.0		11.0	
	RCS Jet -X38	vdc	9.0		11.0	
	RCS Jet -X48	vdc	9.0		11.0	
	RCS Jet -X11a	vdc	9.0		11.0	
10	Eng On	vdc	2.0		5.0	
	Eng Off	vdc	2.0		5.0	

DATE \_\_\_\_\_

APOLLO G&N  
EQUIPMENT TEST  
DATA SHEET 5 OF 6

JDC  
NO. 12121  
REV. A

JOB LGC OUTPUT TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ ACC
53.B	Pulse Width	u sec	2.0		4.0	
53.C	Droop	volts			A/5	
53.D	Rise Time	u sec			0.2	
53.E	Backsawing	volts			4.0	
53.F	Noise	P-PV	0		0.4	
56	RR Range Read Cycle Timing	u sec	80.935			
58	RR Range Gate Strobe Timing	u sec	1.75		2.25	
59.A	Amplitude	volts	4.0		10.0	
59.B	Pulse Width	u sec	4.0		10.0	
59.C	Droop	volts			A/5	
59.D	Rise Time	u sec			0.2	
59.E	Backsawing	volts			4.0	
59.F	Noise	P-PV	0		0.4	
62	RR Range Read Cycle Timing	u sec	80.935			
63.A	Amplitude	volts	4.0		10.0	
63.B	Pulse Width	u sec	2.0		4.0	
63.C	Droop	volts			A/5	
63.D	Rise Time	u sec			0.2	
63.E	Backsawing	volts			0.2	
63.F	Noise	P-PV	0		0.4	
65	RR Range Gate Strobe Timing	u sec	1.75		2.25	
66.A	Amplitude	volts	4.0		10.0	
66.B	Pulse Width	u sec	2.0		4.0	
66.C	Droop	volts			A/5	

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APOLLO G&N  
EQUIPMENT TEST  
DATA SHEET 6 OF 6

JDC  
NO. 12621  
REV. A

JOB LGC OUTPUT TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ ACC
66.D	Rise Time	u sec			.20	
66.E	Backsawing	volts			4.0	
66.F	Noise	PP-V	0		0.4	
71.A	Amplitude	volts	4.0		10.0	
71.B	Pulse Width	u sec	2.0		4.0	
71.C	Droop	volts			A/5	
71.D	Rise Time	u sec			2.0	
71.E	Backsawing	volts			4.0	
72	DLNK Data Sync Delay Time	u sec			1 u sec	
73	Telemetry DLNK Data					
73.A	Amplitude	volts	5.0		9.0	
73.B	Pulse Width	u sec	2.0		6.0	
73.D	Droop	volts			A/5	
73.E	Rise Time	u sec			0.2	

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APOLLO G & N  
EQUIPMENT TEST  
DATA SHEET 2 OF 2

JDC  
NO. 12621  
REV. A

JOB

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ ACC
12	Eng On	vdc	9.0		11.0	
	Eng Off	vdc	9.0		11.0	
13.a	+Pitch Gimbal Trim	vdc	2.0		5.0	
13.b	-Pitch Gimbal Trim	vdc	2.0		5.0	
13.c	+Roll Gimbal Trim	vdc	2.0		5.0	
13.d	-Roll Gimbal Trim	vdc	2.0		5.0	
16	+Pitch Gimbal Trim	vdc	9.0		11.0	
	-Pitch Gimbal Trim	vdc	9.0		11.0	
	+Roll Gimbal Trim	vdc	9.0		11.0	
	-Roll Gimbal Trim	vdc	9.0		11.0	
18A	Amplitude	volts	4.0		10.0	
18B	Pulse Width	u sec	2.0		4.0	
18C	Drop	volts			A/5	
18D	Rise Time	u sec			0.20	
18E	Backswing	volts			4.0	
18F	Noise	P-PV	0		0.4	
20A	Amplitude	volts	4.0		10.0	
20B	Pulse Width	u sec	2.0		4.0	
20C	Drop	volts			A/5	
20D	Rise Time	u sec			0.20	
20E	Backswing	volts			4.0	
20F	Noise	P-PV	0		0.4	

DATE

APOLLO G & N  
EQUIPMENT TEST  
DATA SHEET 4 OF 4

JDC  
NO. 12621  
REV. A

JOB

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ ACC
22.a.A	Amplitude	volts	4.0		10.0	
22.a.B	Pulse Width	u sec	2.0		4.0	
22.a.C	Drop	volts			A/5	
22.a.D	Rise Time	u sec	2.0		4.0	
22.A.E	Backswing	volts			4.0	
22.b.A	Amplitude	volts	4.0		10.0	
22.b.B	Pulse Width	u sec	2.0		4.0	
22.b.C	Drop	volts			A/5	
22.b.D	Rise Time	u sec			2.0	
22.b.E	Backswing	volts			4.0	
24.a.A	Amplitude	volts	4.0		10.0	
24.a.B	Pulse Width	u sec	2.0		4.0	
24.a.C	Drop	volts			A/5	
24.a.D	Rise Time	u sec			.2	
24.a.E	Backswing	volts			4.0	
24.b.A	Amplitude	volts	4.0		10.0	
24.b.B	Pulse Width	u sec	2.0		4.0	
24.b.C	Drop	volts			A/5	
24.b.D	Rise Time	u sec			.2	
24.b.E	Backswing	volts			4.0	
26.a.A	Amplitude	volts	4.0		10.0	
26.a.B	Pulse Width	u sec	2.0		4.0	

DATE

APOLLO G & N  
EQUIPMENT TEST  
DATA SHEET 5 OF 5

JDC  
NO. 12621  
REV. A

JOB

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ ACC
26.a.C	Drop	volts			A/5	
26.a.D	Rise Time	u sec			.2	
26.a.E	Backswing	volts			4.0	
26.a.F	Noise	volts	0		.4	
26.b.A	Amplitude	volts	4.0		10.0	
26.b.B	Pulse Width	u sec	2.0		4.0	
26.b.C	Drop	volts			A/5	
26.b.D	Rise Time	u sec			.2	
26.b.E	Backswing	volts			4.0	
26.b.F	Noise	volts	0		.4	
31.A	Amplitude	volts	4.0		10.0	
47.A	Amplitude	volts	4.0		10.0	
47.B	Pulse Width	u sec	2.0		4.0	
47.C	Drop	volts			A.5	
47.D	Rise Time	u sec			.20	
47.E	Backswing	volts			4.0	
47.F	Noise	volts	0		0.4	
50	IR V <sub>1</sub> Read Cycle Timing	u sec	80.935			
52	IR V <sub>1</sub> Gate Strobe Timing	u sec	1.75		2.25	

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APOLLO G & N  
EQUIPMENT TEST  
DATA SHEET 6 OF 6

JDC  
NO. 12621  
REV. A

JOB

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ ACC
53.A	Amplitude	volts	4.0		10.0	
53.B	Pulse Width	u sec	2.0		4.0	
53.C	Drop	volts			A/5	
53.D	Rise Time	u sec			0.2	
53.E	Backswing	volts			4.0	
53.F	Noise	P-PV	0		0.4	
56	IR Range Read Cycle Timing	u sec	80.935		2.25	
58	IR Range Gate Strobe Timing	u sec	1.75		10.0	
59.A	Amplitude	volts	4.0		10.0	
59.B	Pulse Width	u sec	4.0		A/5	
59.C	Drop	volts			0.2	
59.D	Rise Time	u sec			4.0	
59.E	Backswing	volts			0.4	
59.F	Noise	P-PV	0			
62	IR Range Read Cycle Timing	u sec	80.935		10.0	
63.A	Amplitude	volts	4.0		4.0	
63.B	Pulse Width	u sec	2.0		A/5	
63.C	Drop	volts			0.2	
63.D	Rise Time	u sec			0.2	
63.E	Backswing	volts				

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APOLLO G & N  
EQUIPMENT TEST  
DATA SHEET 1 OF 1

JDC  
NO. 12621  
REV. A

JOB

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
63.F	Noise	P-PV	0		0.4		
65	RR Range Gate Strobe Timing	u sec	1.75		2.25		
66.A	Amplitude	volts	4.0		10.0		
66.B	Pulse Width	u sec	2.0		4.0		
66.C	Droop	volts			A/5		
66.D	Rise Time	u sec			.20		
66.E	Backsawing	volts			4.0		
66.F	Noise	PP-V	0		0.4		
71.A	Amplitude	volts	4.0		10.0		
71.B	Pulse Width	u sec	2.0		4.0		
71.C	Droop	volts			A/5		
71.D	Rise Time	u sec			2.0		
71.E	Backsawing	volts			4.0		
72	MARK Data Sync Delay Time	u sec			1 u sec		
73	Telemetry MARK Data						
73.A	Amplitude	volts	5.0		9.0		
73.B	Pulse Width	u sec	2.0		6.0		
73.D	Droop	volts.			A/5		
73.E	Rise Time	u sec			0.2		

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SUBSYSTEM LEM G & N SYSTEM  
DESCRIPTION This test is designed to check the discrete outputs of the RCS jet and SCS command interface, and the pulse train outputs of the Main Engine command, Altitude meter, Landing Radar, Rendezvous Radar and Downlink Interface.

Rev. Let.	Date	TDRR NO.	PAGES REVISED	APPROVAL	REFERENCES
A	8-13-66	30551	ALL	MIT	NASA
B	10-6-66	31443	2-9	EA/KA	EA/KA
					IMPORTANT
					INTERVAL
					TOOLS AND MATERIAL

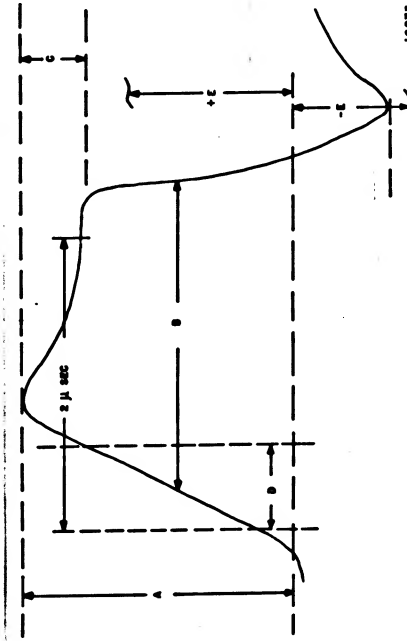
1. Establish a Master Initialization condition. Insure that the ISS is in the Standby condition and that the LGC is on.  
CTS SWITCH INITIALIZATION
2. Set the VOLTAGE SELECT on the Power Control panel to RDC. Set the switches on RDC Interface panel as follows:
  - a. DE MARGINS to NORM
  - b. CHV METERS to DCVM
  - c. CHANNEL V selector to 601
3. Perform the following DSKY operations:
  - a. VERB 57 ENTR
  - b. 00011 ENTR
  - c. ObserveRow 1 Indicates 00005

VERIFICATION WITH SID REQUIRED BEFORE USE  
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- SUBSYSTEM LEM G & N SYSTEM  
ASSY
5. Press the ENTR pushbutton on the DSKY. Observe Row 1 indicates 00006 and Row 2 indicates 00377.
6. Repeat step 4.
7. Set the CHANNEL V selectors to the positions specified below and record the DCVM indications for each position.
- | CHANNEL V | RCS JET |
|-----------|---------|
| a. 609    | +73F    |
| b. 610    | -74F    |
| c. 611    | -71F    |
| d. 612    | +72F    |
| e. 613    | +Y2S    |
| f. 614    | -Y3S    |
| g. 615    | -Y4S    |
| h. 616    | -Y1S    |
8. Press the ENTR pushbutton on the DSKY. Observe Row 1 indicates 00011 and Row 2 indicates 30000.
9. Repeat step 7.
- ENG ON-OFF ASC OR DESC TEST
10. Set the CHANNEL V selectors to 506 (ENG ON, ASC OR DESC) and 520 (ENG OFF, ASC OR DESC). Record the DCVM indications for each position.
11. Press the ENTR pushbutton on the DSKY. Observe Row 1 indicates 00012 and Row 2 indicates 37400.
12. Set the CHANNEL V selectors to 506 and 520. Record the DCVM indications for each position.
- PITCH-ROLL GIMBAL TRIM TESTS
13. Set the CHANNEL V selectors to the positions specified below and record the DCVM indications for each position.
- | CHANNEL V | RCS JET |
|-----------|---------|
| a. 601    | -X4U    |
| b. 602    | +X4D    |
| c. 603    | -X3U    |
| d. 604    | +X3D    |
| e. 605    | -X2U    |
| f. 606    | +X2D    |
| g. 607    | -X1U    |
| h. 608    | +X1D    |

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- SUBSYSTEM LEM G & N SYSTEM  
ASSY
2. Scope B output (XY Panel) to Channel B input on the scope. Set the Mode Function Switch on the scope to Channel A.
18. Measure and record the oscilloscope indications of A through F. (See Figure 1.)
19. Press the ENTR pushbutton on the DSKY. The signal on the oscilloscope shall disappear.
20. Set the CHANNEL T switches to 214 (DEC THROTTLE RATE DESC ENGINE).
- Measure and record the oscilloscope indications of A through F. (See Figure 1.)
21. Press the ENTR pushbutton on the DSKY. The signal on the oscilloscope shall disappear.
- ALTITUDE "1", ALTITUDE "0" TEST
22. Set the CHANNEL T switches to 317 (ALTITUDE "1") and 318 (ALTITUDE "0"). Measure and record the oscilloscope



- A - Amplitude: measured to pulse maximum positive level  
B - Pulse width: measured at A/2 level  
C - Droop: measured from pulse maximum positive level to level at 2 microseconds  
D - Rise Time: time required for pulse to rise from 10% to 90% of A  
E - Backsawing: measured to signal maximum negative level  
F - Noise: (No Pulse)

Figure 1. Waveform Description

- SUBSYSTEM LEM G & N SYSTEM  
ASSY
28. Set the FREQ + PHASE switch on the XY Interface Panel to FR T 1-S. Connect a coax jumper to CNTR-A and FREQ AC on the Frequency Counter Panel. Connect a coax jumper to CNTR-B and STOP-B.
29. Set the Frequency Counter Panel controls as follows:
- a. INPUT VOLTS RMS selector to 6.4
  - b. TRIGGER LEVEL control to mid range
  - c. TIME selector to MS
  - d. DISPLAY fully CCW but not into detent position
  - e. GATE switch to AUTO
  - f. FUNCTION switch to A-B
  - g. SLOPE to (+)
- NOTE: Disregard the PROG and TRACKER alarms during the following test.
30. Make the following switch settings on the AGC INPUT COUNTERS portion of the XY Interface Panel:
- a. Selector to 12
  - b. STANDARD RATE pushbutton - press to light
  - c. POSITIVE pushbutton - press to light
  - d. OUT IN pushbutton - press to light
  - e. Set C33-4, C33-5, C33-8 on RDC Panel.

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JOB	LGC OUTPUT TEST	JDC 12621 REV B PAGE 5 OF 9
SUBSYSTEM	LEM G & N SYSTEM	ASSY
31. Press VERB 57 ENTR, 00014 ENTR VERB 33 ENTR. Record the counter indication.	record the oscilloscope indications of A through F. (See Figure 1.)	
NOTE: If in the above step the counter did not count or did not indicate about 80 milliseconds, press RESET and adjust the INPUT VOLTS RMS and TRIGGER LEVEL controls concurrently until a repeatable or satisfactory indication is present.	LR RANGE DATA ACQUISITION TEST	
LR RANGE GATE STROBE TEST	36. Perform the following DSKY operations:	
32. Set the SCOPE switch on the XY Interface Panel to the T-Y position. Set the oscilloscope MODE switch to A. Measure and record the indication of A through F. (See Figure 1.) After completing measurements, return the SCOPE switch on the XY Interface Panel to the S-T position and the oscilloscope MODE switch to ALT.	a. VERB 14 NOUN 01 ENTR	
LR RANGE GATE STROBE TIMING TEST	b. Address of V Z data	
33. Set the CHANNEL S switches to 118 (LR RESET STROBE).	LR Range data 03437	
34. Determine the timing lag of a LR Range Gate Strobe pulse (T-220) to a LR Reset Strobe pulse (S-118) at their respective A/2 points.	c. Observe Row 1 indicates 00011	
LR SYNC FOR READOUT STROBE TEST	d. Observe Row 2 indicates 37653	
35. Set the CHANNEL S switches to 314 (LR SYNC FOR READOUT). Measure and	READ CYCLE TIMING TEST LR V Z	
	37. Reset the Frequency Counter. Set the CHANNEL T switches to 219 (LR Z A GATE STROBE).	
	38. Enter VERB 33 and press the ENTR pushbutton on the DSKY. Record the Frequency Counter indication.	
	LR V Z GATE STROBE TIMING TEST	
	39. Set the CHANNEL S switches to 118.	
	40. Determine and record the timing lag of a LR V Z Gate Strobe pulse (T-219) to a LR Reset Strobe pulse (S-118) at their respective A/2 points.	
	LR V Z GATE STROBE TEST	
	NOTE: The pulse to be measured in step 41 will be found on the B trace.	
	41. Measure and record the oscilloscope indications of A through F. (See Figure 1.)	

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JOB	LGC OUTPUT TEST	JDC 12621 REV B PAGE 6 OF 9
SUBSYSTEM	LEM G & N SYSTEM	ASSY
LR V Z DATA ACQUISITION TEST	42. Perform the following DSKY operations:	
a. VERB 14 NOUN 01 ENTR	b. Address of V Z data	
c. Observe Row 1 indicates 00001	d. Observe Row 2 indicates 10437	
LR V X READ CYCLE TIMING TEST	43. Reset the Frequency Counter. Set the CHANNEL T switches to 218 (LR V Y GATE STROBE) and CHANNEL S switches to 314.	
44. Enter VERB 33 and press the ENTR pushbutton on the DSKY. Record the Frequency Counter indication.	LR V Y GATE STROBE TIMING TEST	
45. Set the CHANNEL S switches to 118.	46. Determine and record the timing lag of a LR V Y Gate Strobe pulse (T-218) at their respective A/2 points.	
LR V Y STROBE TEST	NOTE: The pulse to be measured in step 47 will be found on the B trace.	
47. Measure and record the oscilloscope indications of A through F. (See Figure 1.)		

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JOB	LGC OUTPUT TEST	JDC 12621 REV B PAGE 7 OF 9
SUBSYSTEM	LEM G & N SYSTEM	ASSY
LR V X DATA ACQUISITION TEST	RR RANGE RATE DATA ACQUISITION TEST	
54. Perform the following DSKY operations:	60. Perform the following DSKY operations:	
a. VERB 14 NOUN 01 ENTR	a. VERB 14 NOUN 01 ENTR	
b. Address of X A data 03437	b. Address of RR Range data 03437	
c. Observe Row 1 indicated 00001	c. Observe Row 1 indicates 77777	
d. Observe Row 2 indicates 10437	d. Observe Row 2 indicates 36627	
RR RANGE RATE READ CYCLE TIMING TEST	RR RANGE READ CYCLE TIMING TEST	
55. Reset the Frequency Counter. Set the CHANNEL T switches to 216 (RR RANGE RATE STROBE) and the CHANNEL S switches to 313.	61. Reset the Frequency Counter. Set the CHANNEL T switches to 215 (RR RANGE GATE STROBE) and the CHANNEL S switches to 313 (RR SYNC FOR READOUT).	
56. Enter VERB 33 and press the ENTR pushbutton on the DSKY. Record the Frequency Counter indication.	62. Enter VERB 33 and press the ENTR pushbutton on the DSKY. Record the Frequency Counter indication.	
RR RANGE RATE GATE STROBE TIMING TEST	RR SYNC FOR READOUT STROBE TEST	
57. Set the CHANNEL S switches to 105.	63. Measure and record the oscilloscope indications of A through F. (See Figure 1.)	
58. Determine and record the timing lag of a RR Range Rate Gate Strobe pulse (T216) to a RR Reset Strobe pulse (S-105) at their respective A/2 points.	RR RANGE GATE STROBE TIMING TEST	
RR RANGE RATE GATE STROBE TEST	64. Set the CHANNEL S switches to 105.	
NOTE: The pulse to be measured in step 59 will be found on the B trace.	65. Determine and record the timing lag of a RR Range Gate Strobe pulse (T-215) to a RR Reset Strobe pulse (S-105) at their respective A/2 points.	
59. Measure and record the oscilloscope indications of A through F. (See Figure 1.)	RR RANGE GATE STROBE TEST	
	NOTE: The pulse to be measured in step 66 will be found on the B trace.	
	66. Measure and record the oscilloscope indications of A through F. (See Figure 1.)	

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JOB	LGC OUTPUT TEST	JDC 12621 REV B PAGE 8 OF 9
SUBSYSTEM	LEM G & N SYSTEM	ASSY
RR RANGE DATA ACQUISITION TEST	67. Perform the following DSKY operations:	
a. VERB 14 NOUN 01 ENTR	b. Address of RR Range data 03437	
c. Observe Row 1 indicates 00017	d. Observe Row 2 indicates 37770	
68. Deactivate all switches on the XY Interface Panel. Enter VERB 36 and press the ENTR pushbutton on the DSKY.	DOWN LINK TELEMETRY TEST	
69. Perform the following DSKY operations:	a. VERB 21 NOUN 01 ENTR	
b. 01750	c. 11753	
d. NOUN 15	e. 01755	
f. 04353	g. 00100	
h. 77777	i. 55753	
j. 31754	k. 55000	
l. 25757	m. 01750	

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72. Set the CHANNEL 8 switches to 307 (DLNK SYNC). Set scope mode switch to ALT. Measure and record the delay of the DLNK DATA pulse with respect to the DLNK SYNC pulse.

73. Press the WORD RATE 10 PPS push-button, the pushbutton shall light. Press the WORD RATE 50 PPS pushbutton, the pushbutton shall go out. Adjust the oscilloscope and repeat step 71.

74. Press the WORD RATE 300 PPS push-button, the pushbutton shall light. Press the WORD RATE 10 PPS pushbutton, the pushbutton shall go out.

NOTE: The PROG alarm on the DSKY shall light.

75. Perform the following DSKY operations:

- a. VERB 01 NOUN 10 ENTR
- b. 00033 ENTR
- c. Observe

Row 1 indicates XXXXX

76. Press the DL ENABLE pushbutton. Set the CHANNEL 8 and T switches to 101. Press the WORD RATE 300 PPS pushbutton, the pushbutton shall go out.

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JOB LGC OUTPUT TEST

ASSEMBLY UNDER TEST		TEST HISTORY	
TITLE	DATE	START	END
SER. NO.	DWG	REV.	SITE / LOCATION
MAJOR GROUND SUPPORT EQUIPMENT			
NAME		SER. NO.	CAL DATE
NAME		SER. NO.	CAL DATE
CONDUCTED BY		APPROVED BY	
NAME/AFFILIATION		NAME/AFFILIATION	

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ ACC
4.a	RCS Jet -X4U	vdv	2.0		5.0	
4.b	RCS Jet +X4D	vdv	2.0		5.0	
4.c	REC Jet -X3U	vdv	2.0		5.0	
4.d	RCS Jet +X3D	vdv	2.0		5.0	
4.e	RCS Jet -X2U	vdv	2.0		5.0	
4.f	RCS Jet +X2D	vdv	2.0		5.0	
4.g	RCS Jet -X1U	vdv	2.0		5.0	
4.h	RCS Jet +X1D	vdv	2.0		5.0	
6	RCS Jet -X4U	vdv	9.0		11.0	
	RCS Jet +X4D	vdv	9.0		11.0	
	RCS Jet -X3U	vdv	9.0		11.0	
	RCS Jet +X3D	vdv	9.0		11.0	
	RCS Jet -X2U	vdv	9.0		11.0	
	RCS Jet +X2D	vdv	9.0		11.0	
	RCS Jet -X1U	vdv	9.0		11.0	
	RCS Jet +X1D	vdv	9.0		11.0	
7.u	RCS Jet +23F	vdv	2.0		5.0	
7.b	RCS Jet -24F	vdv	2.0		5.0	

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JOB LGC OUTPUT TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ ACC
7.c	RCS Jet -Z1F	vdv	2.0		5.0	
7.d	RCS Jet +Z2F	vdv	2.0		5.0	
7.e	RCS Jet +Y2S	vdv	2.0		5.0	
7.f	RCS Jet -Y3S	vdv	2.0		5.0	
7.g	RCS Jet -Y4S	vdv	2.0		5.0	
7.h	RCS Jet -Y1s	vdv	2.0		5.0	
9	RCS Jet +Z3F	vdv	9.0		11.0	
	RCS Jet -Z4F	vdv	9.0		11.0	
	RCS Jet -Z1F	vdv	9.0		11.0	
	RCS Jet +Z2F	vdv	9.0		11.0	
	RCS Jet +Y2s	vdv	9.0		11.0	
	RCS Jet -Y3S	vdv	9.0		11.0	
	RCS Jet -Y4S	vdv	9.0		11.0	
10	RCS Jet -Y1s	vdv	9.0		11.0	
	Eng On	vdv	2.0		5.0	
	Eng Off	vdv	2.0		5.0	
12	Eng On	vdv	9.0		11.0	
	Eng Off	vdv	9.0		11.0	
13.a	+Pitch Gimbal Trim	vdv	2.0		5.0	
13.b	-Pitch Gimbal Trim	vdv	2.0		5.0	
13.c	+Roll Gimbal Trim	vdv	2.0		5.0	
13.d	-Roll Gimbal Trim	vdv	2.0		5.0	
16	+Pitch Gimbal Trim	vdv	9.0		11.0	
	-Pitch Gimbal Trim	vdv	9.0		11.0	
	+Roll Gimbal Trim	vdv	9.0		11.0	
	-Roll Gimbal Trim	vdv	9.0		11.0	
18A	Amplitude	volts	4.0		10.0	

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JOB LGC OUTPUT TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ ACC
18B	Pulse Width	u sec	2.0		4.0	
18C	Droop	volts			A/5	
18D	Rise Time	u sec			0.20	
18E	Backawing	volts			4.0	
18F	Noise	P-PV	0		0.4	
20A	Amplitude	volts	4.0		10.0	
20B	Pulse Width	u sec	2.0		4.0	
20C	Droop	volts			A/5	
20D	Rise Time	u sec			0.20	
20E	Backawing	volts			4.0	
20F	Noise	P-PV	0		0.4	
22.a.A	Amplitude	volts	4.0		10.0	
22.a.B	Pulse Width	u sec	2.0		4.0	
22.a.C	Droop	volts			A/5	
22.a.D	Rise Time	u sec	2.0		4.0	
22.a.E	Backawing	volts			4.0	
22.b.A	Amplitude	volts	4.0		10.0	
22.b.B	Pulse Width	u sec	2.0		4.0	
22.b.C	Droop	volts			A/5	
22.b.D	Rise Time	u sec			2.0	
22.b.E	Backawing	volts			4.0	
24.a.A	Amplitude	volts	4.0		10.0	
24.a.B	Pulse Width	u sec	2.0		4.0	
24.a.C	Droop	volts			A/5	
24.a.D	Rise Time	u sec			.2	
24.a.E	Backawing	volts			4.0	
24.b.A	Amplitude	volts	4.0		10.0	
24.b.B	Pulse Width	u sec	2.0		4.0	

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EQUIPMENT TEST  
DATA SHEET 4 OF 7

JDC  
NO. 12621  
REV. B

JOB LGC OUTPUT TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ ACC
24.b.C	Droop	volts			A/5	
24.b.D	Rise Time	u sec			.2	
24.b.E	Backsawing	volts			4.0	
26.a.A	Amplitude	volts	4.0		10.0	
26.a.B	Pulse Width	u sec	2.0		4.0	
26.a.C	Droop	volts			A/5	
26.a.D	Rise Time	u sec			.2	
26.a.E	Backsawing	volts			4.0	
26.a.F	Noise	volts	0		.4	
26.b.A	Amplitude	volts	4.0		10.0	
26.b.B	Pulse Width	u sec	2.0		4.0	
26.b.C	Droop	volts			A/5	
26.b.D	Rise Time	u sec			.2	
26.b.E	Backsawing	volts			4.0	
26.b.F	Noise	volts	0		.4	
31.	LR Range Read Cycle Timing	m sec	80.315			
32.A	Amplitude	volts	4.0		10.0	
32.B	Pulse Width	u sec	2.0		4.0	
32.C	Droop	volts			A/5	
32.D	Rise Time	u sec			0.20	
32.E	Backsawing	volts			4.0	
32.F	Noise	volts	0		0.4	
34	LR Range Gate Strobe Timing	u sec	1.75		2.25	
35.A	Amplitude	volts	4.0		10.0	
35.B	Pulse Width	u sec	2.0		4.0	

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APOLLO G8N  
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DATA SHEET 5 OF 7

JDC  
NO. 12621  
REV. B

JOB LGC OUTPUT TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ ACC
35.C	Droop	volts			A/5	
35.D	Rise Time	u sec			0.20	
35.E	Backsawing	volts			4.0	
35.F	Noise	volts	0		0.4	
38	LR V <sub>Z</sub> Read Cycle Timing	m sec	80.315			
40	LR V <sub>Z</sub> Gate Strobe Timing	u sec	1.75		2.25	
41.A	Amplitude	volts	4.0		10.0	
41.B	Pulse Width	u sec	2.0		4.0	
41.C	Droop	volts			A/5	
41.D	Rise Time	u sec			0.20	
41.E	Backsawing	volts			4.0	
41.F	Noise	volts	0		0.4	
44	LR V <sub>Y</sub> Read Cycle Timing	m sec	80.315			
46	LR V <sub>Y</sub> Gate Strobe Timing	u sec	1.75		2.25	
47.A	Amplitude	volts	4.0		10.0	
47.B	Pulse Width	u sec	2.0		4.0	
47.C	Droop	volts			A.5	
47.D	Rise Time	u sec			.20	
47.E	Backsawing	volts			4.0	
47.F	Noise	volts	0		0.4	
50	LR V <sub>X</sub> Read Cycle Timing	m sec	80.315			
52	LR V <sub>X</sub> Gate Strobe Timing	u sec	1.75		2.25	

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EQUIPMENT TEST  
DATA SHEET 6 OF 7

JDC  
NO. 12621  
REV. B

JOB LGC OUTPUT TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ ACC
53.A	Amplitude	volts	4.0		10.0	
53.B	Pulse Width	u sec	2.0		4.0	
53.C	Droop	volts			A/5	
53.D	Rise Time	u sec			0.2	
53.E	Backsawing	volts			4.0	
53.F	Noise	P-PV	0		0.4	
56	RR Range Rate Read Cycle Timing	m sec	80.935			
58	RR Range Rate Gate Strobe Timing	u sec	1.75		2.25	
59.A	Amplitude	volts	4.0		10.0	
59.B	Pulse Width	u sec	4.0		10.0	
59.C	Droop	volts			A/5	
59.D	Rise Time	u sec			0.2	
59.E	Backsawing	volts			4.0	
59.F	Noise	P-PV	0		0.4	
62	RR Range Read Cycle Timing	m sec	80.935			
63.A	Amplitude	volts	4.0		10.0	
63.B	Pulse Width	u sec	2.0		4.0	
63.C	Droop	volts			A/5	
63.D	Rise Time	u sec			0.2	
63.E	Backsawing	volts			0.2	
63.F	Noise	P-PV	0		0.4	
65	RR Range Gate Strobe Timing	u sec	1.75		2.25	
66.A	Amplitude	volts	4.0		10.0	
66.B	Pulse Width	u sec	2.0		4.0	
66.C	Droop	volts			A/5	

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APOLLO G8N  
EQUIPMENT TEST  
DATA SHEET 7 OF 7

JDC  
NO. 12621  
REV. B

JOB LGC OUTPUT TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ ACC
66.D	Rise Time	u sec			.20	
66.E	Backsawing	volts			4.0	
66.F	Noise	PP-V	0		0.4	
71.A	Amplitude	volts	4.0		10.0	
71.B	Pulse Width	u sec	2.0		4.0	
71.C	Droop	volts			A/5	
71.D	Rise Time	u sec			2.0	
71.E	Backsawing	volts			4.0	
72	DLNK Data Sync Delay Time	u sec			1 u sec	
73	Telemetry DLNK Data					
73.A	Amplitude	volts	5.0		9.0	
73.B	Pulse Width	u sec	2.0		6.0	
73.D	Droop	volts			A/5	
73.E	Rise Time	u sec			0.2	

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SUBSYSTEM LEM G & N SYSTEM  
DESCRIPTION This test is designed to check the discrete outputs of the RCS Jet and SCS command interface, and the pulse train outputs of the Main Engine command, Altitude meter, Landing Radar, Rendezvous Radar and Downlink Interface.

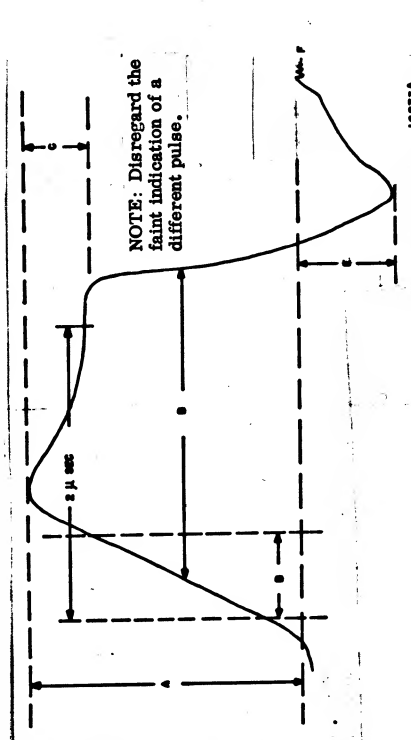
Rev.	Date	TDRR NO.	PAGES REVISED	APPROVAL	REFERENCES
1	8-10-66	30551	JDC	MIT	NASA
2	10-6-66	31443	All	E.A.H.	-
3	11-25-66	32052	2-9	E.A.H.	-
			2-9	3.6	IMPORTANT
					INTERVAL
					TOOLS AND MATERIAL

- Establish a Master Initialization condition. Insure that the ISS is in the Standby condition and that the LGC is on.  
CTS SWITCH INITIALIZATION
- Set the VOLTAGE SELECT on the Power Control panel to RDC. Set the switches on RDC Interface panel as follows:
  - DE MARGINS to NORM
  - CHV METERS to DCVM
  - CHANNEL V selector to 601
- Perform the following DSKY operations:
  - VERB 57 ENTR
  - 00011 ENTR
  - Observe  
Row 1 indicates 00005

VERIFICATION WITH SIDL REQUIRED BEFORE USE  
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- Scope B output (XY Panel) to Channel B input on the scope.  
Set the MODE switch to A+B.  
Set scope B switch to INVERT DC.
- Measure and record the oscilloscope indications of A through F. (See Figure 1.)
- Press the ENTR pushbutton on the DSKY. The signal on the oscilloscope shall disappear.
- Set the CHANNEL T switches to 214 (DEC THROTTLE RATE DESC ENGINE).



- Figure 1. Waveform Description
- A - Amplitude: measured to pulse maximum positive level
  - B - Pulse width: measured at A/2 level
  - C - Drop: measured from pulse maximum positive level to level at 2 microseconds
  - D - Rise Time: time required for pulse to rise from 10% to 90% of A
  - E - Backswing: measured to signal maximum negative level
  - F - Noise: (No Pulse)

Figure 1. Waveform Description

SUBSYSTEM LEM G & N SYSTEM

- Press the ENTR pushbutton on the DSKY. Observe Row 1 indicates 00006 and Row 2 indicates 00377.
- Repeat step 4.
- Set the CHANNEL V selectors to the positions specified below and record the DCVM indications for each position.

CHANNEL V	RCS JET
a. 609	+Z3F
b. 610	-Z4F
c. 611	-Z1F
d. 612	+Z2F
e. 613	+Y2S
f. 614	-Y3S
g. 615	-Y4S
h. 616	-Y1S

- Press the ENTR pushbutton on the DSKY. Observe Row 1 indicates 00011 and Row 2 indicates 30000.
- Repeat step 7.
- ENG ON-OFF ASC OR DESC TEST
- Set the CHANNEL V selectors to 506 (ENG ON, ASC OR DESC) and 520 (ENG OFF, ASC OR DESC). Record the DCVM indications for each position.
- Press the ENTR pushbutton on the DSKY. Observe Row 1 indicates 00012 and Row 2 indicates 37400.
- Set the CHANNEL V selectors to 506 and 520. Record the DCVM indications for each position.
- PITCH-ROLL GIMBAL TRIM TESTS
- Set the CHANNEL V selectors to the positions specified below and record the DCVM indications for each position.

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- Set the FREQUENCY + PHASE switch on the XY Interface Panel to FR T 4-S. Connect a coax jumper to CNTR-A and FREQ AC on the Frequency Counter Panel. Connect a coax jumper to CNTR-B and STOP-B.
- Set the Frequency Counter Panel controls as follows:
  - INPUT VOLTS RMS selector to 6.4
  - TRIGGER LEVEL control to mid range
  - TIME selector to MS
  - DISPLAY fully CCW but not into detent position
  - GATE switch to AUTO
  - FUNCTION switch to A-B
  - SLOPE to (↑)
- NOTE: Disregard the PROG and TRACKER alarms during the following test.
- Make the following switch settings on the AGC INPUT COUNTERS portion of the XY Interface Panel:
  - Selector to 12
  - STANDARD RATE pushbutton - press to light
  - POSITIVE pushbutton - press to light
  - OUT IN pushbutton - press to light
  - Set C33-4, C33-5, C33-8 on RDC Panel.

JOB LOG OUTPUT TEST		JDC 12621 REV C PAGE 5 OF 9
SUBSYSTEM LEM G & N SYSTEM		ASSY
31. Press VERB 57 ENTR, 00014 ENTR VERB 33 ENTR. Record the counter indication. NOTE: If in the above step the counter did not count or did not indicate about 80 milliseconds, press RESET and adjust the INPUT VOLTS RMS and TRIGGER LEVEL controls concurrently until a repeatable or satisfactory indication is present.		
LR RANGE GATE STROBE TEST 32. Set the SCOPE switch on the XY Interface Panel to the T DIFF position. Measure and record the indication of A through F. (See Figure 1.) After completing measurements, return the SCOPE switch on the XY Interface Panel to the S-T position and the oscilloscope MODE switch to ALT. Set oscilloscope B switch to NORMAL DC.		
LR RANGE GATE STROBE TIMING TEST 33. Set the CHANNEL S switches to 118 (LR RESET STROBE). 34. Determine the timing lag of a LR Range Gate Strobe pulse (T-220) to a LR Reset Strobe pulse (S-118) at their respective A/2 points. LR SYNC FOR READOUT STROBE TEST 35. Set the CHANNEL S switches to 314 (LR SYNC FOR READOUT). Set SCOPE		
switch on XY Interface panel to S DIFF. Set oscilloscope MODE switch to A + B. Set oscilloscope B switch to INVERT DC. On XY Interface panel set FREQ + PHASE switch to OFF. Measure and record the oscilloscope indications of A through F. (See Figure 1.)		
LR RANGE DATA ACQUISITION TEST 36. Perform the following DSKY operations: a. VERB 14 NOUN 01 ENTR b. Address of LR Range data 03437 ENTR c. Observe Row 1 Indicates 00011 d. Observe Row 2 Indicates 37653 READ CYCLE TIMING TEST LR VZ 37. Reset the Frequency Counter. Set the CHANNEL T switches to 219 (LR ZA GATE STROBE). Set the FREQ + PHASE switch on the XY Interface panel to T-8. 38. Enter VERB 33 and press the ENTR pushbutton on the DSKY. Record the Frequency Counter indications. Set FREQ + PHASE switch on XY Interface panel to OFF. LR VZ GATE STROBE TIMING TEST 39. Set the CHANNEL S switches to 118. Set oscilloscope MODE switch to ALT. Set oscilloscope B switch to NORM DC. Set SCOPE switch on XY Interface panel to S-T.		
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JOB LOG OUTPUT TEST		JDC 12621 REV C PAGE 6 OF 9
SUBSYSTEM LEM G & N SYSTEM		ASSY
40. Determine and record the timing lag of a LR VZ Gate Strobe pulse (T-219) to a LR Reset Strobe pulse (S-118) at their respective A/2 points. LR VZ GATE STROBE TEST 41. Set the SCOPE switch on XY Interface panel to T DIFF. Set oscilloscope MODE switch to A + B. Set oscilloscope B switch to INVERT DC. Measure and record oscilloscope indications of A through F of Figure 1. LR VZ DATA ACQUISITION TEST 42. Perform the following DSKY operations: a. VERB 14 NOUN 01 ENTR b. Address of VZ data 03437 ENTR c. Observe Row 1 Indicates 00001 d. Observe Row 2 Indicates 10437 LR VZ READ CYCLE TIMING TEST 43. Reset the Frequency Counter. Set the CHANNEL T switches to 217 (LR VZ GATE STROBE) and CHANNEL S switches to 314. Set FREQ + PHASE switch on XY Interface panel to T-8. 50. Enter VERB 33 and press the ENTR pushbutton on the DSKY. Record the Frequency Counter indication. Set FREQ + PHASE switch on XY Interface panel to OFF. LR VZ GATE STROBE TIMING TEST 51. Set the CHANNEL S switches to 118. Set oscilloscope MODE switch to ALT. Set oscilloscope B switch to NORM DC. Set SCOPE switch on XY Interface panel to S-T. 52. Determine and record the timing lag of a LR VZ Gate Strobe pulse (T-217) to a LR Reset Strobe pulse (S-118) at their respective A/2 points. LR VZ GATE STROBE TEST 53. Repeat step 41.		
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JOB LOG OUTPUT TEST		JDC 12621 REV C PAGE 7 OF 9
SUBSYSTEM LEM G & N SYSTEM		ASSY
LR VZ DATA ACQUISITION TEST 54. Perform the following DSKY operations: a. VERB 14 NOUN 01 ENTR b. Address of XA data 03437 ENTR c. Observe Row 1 Indicates 00001 d. Observe Row 2 Indicates 10437 RR RANGE RATE READ CYCLE TIMING TEST 55. Reset the Frequency Counter. Set the CHANNEL T switches to 216 (RR RANGE RATE STROBE) and the CHANNEL S switches to 313. Set FREQ + PHASE switch on XY Interface panel to T-8. 56. Enter VERB 33 and press the ENTR pushbutton on the DSKY. Record the Frequency Counter indications. Set FREQ + PHASE switch on XY Interface panel to OFF. RR RANGE RATE GATE STROBE TIMING TEST 57. Set the CHANNEL S switches to 105. Set oscilloscope MODE switch to ALT. Set oscilloscope B switch to NORM DC. Set SCOPE switch on XY Interface panel to S-T. 58. Determine and record the timing lag of a RR Range Rate Gate Strobe pulse (T-216) to a RR Reset Strobe pulse (S-105) at their respective A/2 points. RR RANGE RATE GATE STROBE TEST 59. Repeat step 41.		
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JOB LOG OUTPUT TEST		JDC 12621 REV C PAGE 8 OF 9
SUBSYSTEM LEM G & N SYSTEM		ASSY
RR RANGE RATE DATA ACQUISITION TEST 60. Perform the following DSKY operations: a. VERB 14 NOUN 01 ENTR b. Address of RR Range data 03437 ENTR c. Observe Row 1 Indicates 77777 d. Observe Row 2 Indicates 36827 RR RANGE READ CYCLE TIMING TEST 61. Reset the Frequency Counter. Set the CHANNEL T switches to 215 (RR RANGE GATE STROBE) and the CHANNEL S switches to 313 (RR SYNC FOR READOUT). Set FREQ + PHASE switch on XY Interface panel to T-8. 62. Enter VERB 33 and press the ENTR pushbutton on the DSKY. Record the Frequency Counter indication. Set FREQ + PHASE switch on XY Interface panel to OFF. RR SYNC FOR READOUT STROBE TEST 63. Set oscilloscope MODE switch to ALT. Set oscilloscope B switch to NORM DC. Set SCOPE switch on XY Interface panel to S-T. Measure and record the oscilloscope indications of A through F of Figure 1. RR RANGE GATE STROBE TIMING TEST 64. Set the CHANNEL S switches to 105. 65. Determine and record the timing lag of a RR Range Gate Strobe pulse (T-215) to a RR Reset Strobe pulse (S-105) at their respective A/2 points. RR RANGE GATE STROBE TEST 66. Repeat step 41.		
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JOB LOG OUTPUT TEST		JDC 12621 REV C PAGE 8 OF 9
SUBSYSTEM LEM G & N SYSTEM		ASSY
RR RANGE DATA ACQUISITION TEST 67. Perform the following DSKY operations: a. VERB 14 NOUN 01 ENTR b. Address of RR Range data 03437 ENTR c. Observe Row 1 Indicates 00017 d. Observe Row 2 Indicates 37770 68. Deactivate all switches on the XY Interface Panel. Enter VERB 36 and press the ENTR pushbutton on the DSKY. DOWN LINK TELEMETRY TEST 69. Perform the following DSKY operations: a. VERB 21 NOUN 01 ENTR b. 01750 ENTR c. 11753 ENTR d. NOUN 15 ENTR e. 01755 ENTR f. 04353 ENTR g. 00100 ENTR h. 77777 ENTR i. 55753 ENTR j. 31754 ENTR k. 55000 ENTR l. 25757 ENTR m. 01750 ENTR If Row 1 does not indicate 77777, repeat step 69. 70. Make the following switch settings on the XY Interface Panel: a. DL ENABLE pushbutton - press b. WORD RATE 50 PPS pushbutton - press to light c. Press 200 OHM LOAD button for CHANNEL S and CHANNEL T. Set oscilloscope MODE switch to A + B. Set B switch to INVERT DC. d. SCOPE switch to T DIFF. 71. Set the CHANNEL T switches to 102 (DLNK DATA). Measure and record the oscilloscope indications of A through E. (See Figure 1.)		
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SUBSYSTEM LEM G & N SYSTEM

ASSY

72. Set the CHANNEL S switches to 307 (DLNK SYNC). Set scope mode switch to ALT. Measure and record the delay of the DLNK DATA pulse with respect to the DLNK SYNC pulse.

73. Press the WORD RATE 10 PPS pushbutton, the pushbutton shall light. Press the WORD RATE 50 PPS pushbutton, the pushbutton shall go out. Set oscilloscope MODE switch to A - B. Set B switch to INVERT DC. Set SCOPE switch on XY Interface panel to T DIFF. Repeat step 71.

74. Press the WORD RATE 300 PPS pushbutton, the pushbutton shall light. Press the WORD RATE 10 PPS pushbutton, the pushbutton shall go out.

NOTE: The PROG alarm on the DSKY shall light.

75. Perform the following DSKY operations:

- a. VERB 01 NOUN 10 ENTR
- b. 00033 ENTR
- c. Observe

Row 1 indicates X3XXX

76. Press the DL ENABLE pushbutton. Set the CHANNEL S and T switches to 101. Press the WORD RATE 300 PPS pushbutton, the pushbutton shall go out.

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FORM 00144  
Chg. 7-23-65

JDC  
NO. 12621  
REV C

JOB LGC OUTPUT TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ ACC
7.c	RCS Jet -Z1F	vdc	2.0		5.0	
7.d	RCS Jet +Z2F	vdc	2.0		5.0	
7.e	RCS Jet +Y2S	vdc	2.0		5.0	
7.f	RCS Jet -Y3S	vdc	2.0		5.0	
7.g	RCS Jet -Y4S	vdc	2.0		5.0	
7.h	RCS Jet -Y1s	vdc	2.0		5.0	
9	RCS Jet +Z3F	vdc	9.0		11.0	
	RCS Jet -Z4F	vdc	9.0		11.0	
	RCS Jet -Z1F	vdc	9.0		11.0	
	RCS Jet +Z2F	vdc	9.0		11.0	
	RCS Jet +Y2s	vdc	9.0		11.0	
	RCS Jet -Y3S	vdc	9.0		11.0	
	RCS Jet -Y4S	vdc	9.0		11.0	
10	Eng On	vdc	9.0		11.0	
	Eng Off	vdc	2.0		5.0	
12	Eng On	vdc	9.0		11.0	
	Eng Off	vdc	9.0		11.0	
13.a	+Pitch Gimbal Trim	vdc	2.0		5.0	
13.b	-Pitch Gimbal Trim	vdc	2.0		5.0	
13.c	+Roll Gimbal Trim	vdc	2.0		5.0	
13.d	-Roll Gimbal Trim	vdc	2.0		5.0	
16	+Pitch Gimbal Trim	vdc	9.0		11.0	
	-Pitch Gimbal Trim	vdc	9.0		11.0	
	+Roll Gimbal Trim	vdc	9.0		11.0	
	-Roll Gimbal Trim	vdc	9.0		11.0	
18A	Amplitude	volts	4.0		10.0	

DATE 15 MAR 66  
FORM 00147  
Chg. -23-65

JDC  
NO. 12621  
REV C  
INITIAL TORR 27134

JOB LGC OUTPUT TEST

ASSEMBLY UNDER TEST		TEST HISTORY	
TITLE	DATE	START	END
SER. NO.	DWG	REV.	SITE / LOCATION
MAJOR GROUND SUPPORT EQUIPMENT			
NAME	SER. NO.	SER. NO.	CAL DATE
NAME	SER. NO.	SER. NO.	CAL DATE

CONDUCTED BY NAME/AFFILIATION APPROVED BY NAME/AFFILIATION

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ ACC
4.a	RCS Jet -X4U	vdc	2.0		5.0	
4.b	RCS Jet +X4D	vdc	2.0		5.0	
4.c	REC Jet -X3U	vdc	2.0		5.0	
4.d	RCS Jet +X3D	vdc	2.0		5.0	
4.e	RCS Jet -X3U	vdc	2.0		5.0	
4.f	RCS Jet +X3D	vdc	2.0		5.0	
4.g	RCS Jet -X1U	vdc	2.0		5.0	
4.h	RCS Jet +X1D	vdc	2.0		5.0	
6	RCS Jet -X4U	vdc	9.0		11.0	
	RCS Jet +X4D	vdc	9.0		11.0	
	RCS Jet -X3U	vdc	9.0		11.0	
	RCS Jet +X3D	vdc	9.0		11.0	
	RCS Jet -X2U	vdc	9.0		11.0	
	RCS Jet +X2D	vdc	9.0		11.0	
	RCS Jet -X1U	vdc	9.0		11.0	
	RCS Jet +X1D	vdc	9.0		11.0	
7.u	RCS Jet +Z3F	vdc	2.0		5.0	
7.b	RCS Jet -Z4F	vdc	2.0		5.0	

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FORM 00145  
Chg. 7-23-65

JDC  
NO. 12621  
REV C

JOB LGC OUTPUT TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ ACC
18B	Pulse Width	u sec	2.0		4.0	
18C	Droop	volts			A/5	
18D	Rise Time	u sec			0.20	
18E	Backsawing	volts			4.0	
18F	Noise	P-PV	0		0.4	
20A	Amplitude	volts	4.0		10.0	
20B	Pulse Width	u sec	2.0		4.0	
20C	Droop	volts			A/5	
20D	Rise Time	u sec			0.20	
20E	Backsawing	volts			4.0	
20F	Noise	P-PV	0		0.4	
22.a.A	Amplitude	volts	4.0		10.0	
22.a.B	Pulse Width	u sec	2.0		4.0	
22.a.C	Droop	volts			A/5	
22.a.D	Rise Time	u sec			0.2	
22.a.E	Backsawing	volts			4.0	
22.b.A	Amplitude	volts	4.0		10.0	
22.b.B	Pulse Width	u sec	2.0		4.0	
22.b.C	Droop	volts			A/5	
22.b.D	Rise Time	u sec			0.2	
22.b.E	Backsawing	volts			4.0	
24.a.A	Amplitude	volts	4.0		10.0	
24.a.B	Pulse Width	u sec	2.0		4.0	
24.a.C	Droop	volts			A/5	
24.a.D	Rise Time	u sec			.2	
24.a.E	Backsawing	volts			4.0	
24.b.A	Amplitude	volts	4.0		10.0	
24.b.B	Pulse Width	u sec	2.0		4.0	

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FORM 00147  
Chg. 7-23-65



APOLLO G&N  
EQUIPMENT TEST  
DATA SHEET 4 OF 7

JDC  
NO. 12621  
REV. C

JOB LGC OUTPUT TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ ACC
24.b.C	Droop	volts			A/5	
24.b.D	Rise Time	u sec			.2	
24.b.E	Backsawing	volts			4.0	
26.a.A	Amplitude	volts	4.0		10.0	
26.a.B	Pulse Width	u sec	2.0		4.0	
26.a.C	Droop	volts			A/5	
26.a.D	Rise Time	u sec			.2	
26.a.E	Backsawing	volts			4.0	
26.a.F	Noise	volts	0		.4	
26.b.A	Amplitude	volts	4.0		10.0	
26.b.B	Pulse Width	u sec	2.0		4.0	
26.b.C	Droop	volts			A/5	
26.b.D	Rise Time	u sec			.2	
26.b.E	Backsawing	volts			4.0	
26.b.F	Noise	volts	0		.4	
31.	LR Range Read Cycle Timing	m sec	80.315			
32.A	Amplitude	volts	4.0		10.0	
32.B	Pulse Width	u sec	2.0		4.0	
32.C	Droop	volts			A/5	
32.D	Rise Time	u sec			0.20	
32.E	Backsawing	volts			4.0	
32.F	Noise	volts	0		0.4	
34	LR Range Gate Strobe Timing	u sec	1.75		2.25	
35.A	Amplitude	volts	4.0		10.0	
35.B	Pulse Width	u sec	2.0		4.0	

DATE

FORM 30-155  
New 9-30-65

APOLLO G&N  
EQUIPMENT TEST  
DATA SHEET 5 OF 7

JDC  
NO. 12621  
REV. C

JOB LGC OUTPUT TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ ACC
35.C	Droop	volts			A/5	
35.D	Rise Time	u sec			0.20	
35.E	Backsawing	volts			4.0	
35.F	Noise	volts	0		0.4	
38	LR V <sub>Z</sub> Read Cycle Timing	m sec	80.315			
40	LR V <sub>Z</sub> Gate Strobe Timing	u sec	1.75		2.25	
41.A	Amplitude	volts	4.0		10.0	
41.B	Pulse Width	u sec	2.0		4.0	
41.C	Droop	volts			A/5	
41.D	Rise Time	u sec			0.20	
41.E	Backsawing	volts			4.0	
41.F	Noise	volts	0		0.4	
44	LR V <sub>Y</sub> Read Cycle Timing	m sec	80.315			
46	LR V <sub>Y</sub> Gate Strobe Timing	u sec	1.75		2.25	
47.A	Amplitude	volts	4.0		10.0	
47.B	Pulse Width	u sec	2.0		4.0	
47.C	Droop	volts			A/5	
47.D	Rise Time	u sec			.20	
47.E	Backsawing	volts			4.0	
47.F	Noise	volts	0		0.4	
50	LR V <sub>X</sub> Read Cycle Timing	m sec	80.315			
52	LR V <sub>X</sub> Gate Strobe Timing	u sec	1.75		2.25	

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FORM 00155  
New 9-30-65

APOLLO G&N  
EQUIPMENT TEST  
DATA SHEET 6 OF 7

JDC  
NO. 12621  
REV. C

JOB LGC OUTPUT TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ ACC
53.A	Amplitude	volts	4.0		10.0	
53.B	Pulse Width	u sec	2.0		4.0	
53.C	Droop	volts			A/5	
53.D	Rise Time	u sec			0.2	
53.E	Backsawing	volts			4.0	
53.F	Noise	P-PV	0		0.4	
56	RR Range Rate Read Cycle Timing	m sec	80.935			
58	RR Range Rate Gate Strobe Timing	u sec	1.75		2.25	
59.A	Amplitude	volts	4.0		10.0	
59.B	Pulse Width	u sec	2.0		4.0	
59.C	Droop	volts			A/5	
59.D	Rise Time	u sec			0.2	
59.E	Backsawing	volts			4.0	
59.F	Noise	P-PV	0		0.4	
62	RR Range Read Cycle Timing	m sec	80.935			
63.A	Amplitude	volts	4.0		10.0	
63.B	Pulse Width	u sec	2.0		4.0	
63.C	Droop	volts			A/5	
63.D	Rise Time	u sec			0.2	
63.E	Backsawing	volts			4.0	
63.F	Noise	P-PV	0		0.4	
65	RR Range Gate Strobe Timing	u sec	1.75		2.25	
66.A	Amplitude	volts	4.0		10.0	
66.B	Pulse Width	u sec	2.0		4.0	
66.C	Droop	volts			A/5	

DATE

FORM 00155  
New 9-30-65

APOLLO G&N  
EQUIPMENT TEST  
DATA SHEET 7 OF 7

JDC  
NO. 12621  
REV. C

JOB LGC OUTPUT TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ ACC
66.D	Rise Time	u sec			.20	
66.E	Backsawing	volts			4.0	
66.F	Noise	PP-V	0		0.4	
71.A	Amplitude	volts	4.0		10.0	
71.B	Pulse Width	u sec	2.0		4.0	
71.C	Droop	volts			A/5	
71.D	Rise Time	u sec			2.0	
71.E	Backsawing	volts			4.0	
72	DLNK Data Sync Delay Time	u sec			1 u sec	
73	Telemetry DLNK Data					
73.A	Amplitude	volts	5.0		9.0	
73.B	Pulse Width	u sec	2.0		6.0	
73.D	Droop	volts			A/5	
73.E	Rise Time	u sec			0.2	

DATE 15 MAR 66

FORM 00155  
Chg. 7-23-65

DESCRIPTION This test is designed to check the discrete outputs of the RCS Jet and SCS command interface, and the pulse train outputs of the Main Engine command, Altitude meter, Landing Radar, Rendezvous Radar and Downlink Interface.

Rev. Let.	Date	TDR NO.	PAGES REVISED	APPROVAL	REFERENCES
A	8-10-66	3055	JDC	MUT NASA	PS 6015000, JDC 12613
B	10-6-66	3143	All	EA	-
C	11-25-66	3262	2-9	EA	-
D	6-30-67	34038	All	EA	IMPORTANT
					INTERVAL
					TOOLS AND MATERIAL

- IMPORTANT: In some steps the DSKY operations and displays required when the LGC contains Program Aurora 88 (2021101-021) are different from the DSKY operations and displays required when the LGC contains Program Aurora 85 (2021101-011). These differences are noted within the procedures.
- Perform JDC 12613 to establish a Master Initialization condition. Place system in ISS Standby condition.

VERIFICATION WITH SID REQUIRED BEFORE USE  
DATE 15 MAR 66

- CHANNEL T to 213 (INC THROTTLE RATE DESCENT ENGINE)  
1. LOAD CHAN T 200 OHMS - press to test
- Connect coax jumpers as follows:
  - From SCOPE A on XY Interface Panel to Oscilloscope Channel A input jack.
  - From SCOPE A on XY Interface Panel to Oscilloscope EXT TRIG input jack.
  - From SCOPE B on XY Interface Panel to Oscilloscope Channel B input jack.
- On Oscilloscope set
  - SOURCE switch to EXT.
  - MODE switch to A + B.
  - Scope B switch to INVERT DC.
- Measure and record the oscilloscope indications of A through F. (See Figure 1.)
- Press the ENTR pushbutton on the DSKY. The signal on the oscilloscope shall disappear.
- Set the CHANNEL T switches to 214 (DEC THROTTLE RATE DESC ENGINE). Measure and record the oscilloscope indications of A through F. (See Figure 1.)
- Press the ENTR pushbutton on the DSKY. The signal on the oscilloscope shall disappear.
- ALTITUDE "1", ALTITUDE "0" TEST
  - Set the CHANNEL T switches to 317

- ALTITUDE "1" and 318 (ALTITUDE "0"). Measure and record the oscilloscope indications of A through E for each position. (See Figure 1.)
- Press the ENTR pushbutton on the DSKY. Set the CHANNEL T switches to 317 and 318 and observe that the signals on the oscilloscope have disappeared for each position.
- Set CHANNEL T switches to 319 (ALTITUDE RATE "1") and 320 (ALTITUDE RATE "0"). Measure and record the oscilloscope indications of A through E for each position. (See Figure 1.)
- Press the ENTR pushbutton on the DSKY. Set the CHANNEL T switches to 319 and 320 and observe that the signal on the oscilloscope disappears for each position.
- RR AND LR RESET STROBE TEST
  - Press the LOAD CHAN S 200 OHMS pushbutton on the XY Interface Panel to ON. Set the SCOPE switch to DIFF 6.
  - Set the CHANNEL S switches to 105 (RR RESET STROBE) and 118 (LR RESET STROBE) and measure and record the oscilloscope indications of A through F for each position. (See Figure 1.)
  - LR RANGE READ CYCLE TIMING TEST
    - Set the CHANNEL T switches to 220 (LR RANGE GATE STROBE) and CHANNEL S switches to 314 (LR SYNC FOR READ-OUTS).

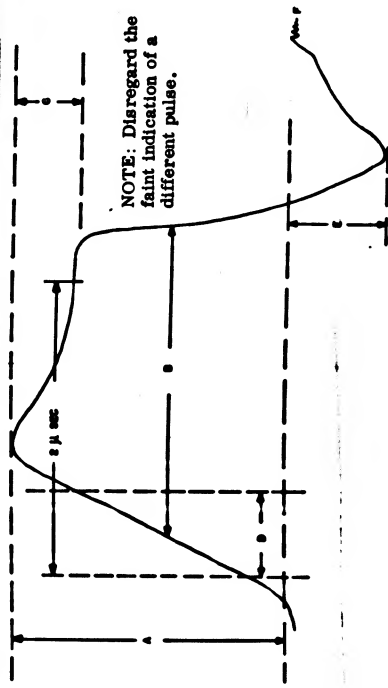
DATE 15 MAR 66

- Set the CHANNEL V selectors to the positions specified below and record the DCVM indications for each position.

CHANNEL V	RCS JET
a. 601	-X4U
b. 602	+X4D
c. 603	-X3U
d. 604	+X3D
e. 605	-X2U
f. 606	+X2D
g. 607	-X1U
h. 608	+X1D
- Press the ENTR pushbutton on the DSKY. Observe Row 1 indicates 00006 and Row 2 indicates 00377.
- Repeat step 4.
- Set the CHANNEL V selectors to the positions specified below and record the DCVM indications for each position.

CHANNEL V	RCS JET
a. 609	+Z3F
b. 610	-Z4F
c. 611	-Z1F
d. 612	+Z2F
e. 613	+Y2S
f. 614	-Y3S
g. 615	-Y4S
h. 616	-Y1S
- Press the ENTR pushbutton on the DSKY. Observe Row 1 indicates 00011 and Row 2 indicates 30000.
- Repeat step 7.

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NOTE: Disregard the faint indication of a different pulse.

Figure 1. Waveform Description

- Set the FREQ + PHASE switch on the XY Interface Panel to FR T T-S. Connect a coax jumper to CNTR-A and FREQ AC on the Frequency Counter Panel. Connect a coax jumper to CNTR-B and STOP-B.
- Set the Frequency Counter Panel controls as follows:
  - INPUT VOLTS RMS selector to 6.4
  - TRIGGER LEVEL control to mid range
  - TIME selector to MS
- DISPLAY fully CCW but not into detent position
- GATE switch to AUTO
- FUNCTION switch to A-B
- SLOPE to (+)

NOTE: Disregard the PROG and TRACKER alarms during the following test.

DATE 15 MAR 66

JOB LGC OUTPUT TEST		JDC 12621 REV D PAGE 5 OF 9
SUBSYSTEM LEM G & N SYSTEM		ASSY
30. Make the following switch settings on the AGC INPUT COUNTERS portion of the XY Interface Panel: a. Selector to 12 b. STANDARD RATE pushbutton - press to light c. POSITIVE pushbutton - press to light d. OUT IN pushbutton - press to light e. Set C33-4, C33-5, C33-8 on RDC Panel. 31. Press VERB 57 ENTR, 00014 ENTR VERB 33 ENTR. Record the counter indication. NOTE: If in the above step the counter did not count or did not indicate about 80 milliseconds, press RESET and adjust the INPUT VOLTS RMS and TRIGGER LEVEL controls concurrently until a repeatable or satisfactory indication is present. LR RANGE GATE STROBE TEST 32. Set SCOPE switch on XY Interface Panel to DIFF T. Measure and record oscilloscope indications A through F. (See Figure 1.) After completing measurements, set SCOPE switch to ALTERNATE S-T, and oscilloscope MODE switch to ALT. Set oscilloscope B switch to NORMAL DC. oscilloscope B switch to NORMAL DC. LR RANGE GATE STROBE TIMING TEST 33. Set the CHANNEL 8 switches to 118 (LR RESET STROBE). 34. Determine the timing lag of a LR Range Gate Strobe pulse (T-220) to a LR Reset Strobe pulse (S-118) at their respective A/2 points. LR SYNC FOR READOUT STROBE TEST 35. Set the CHANNEL 8 switches to 314 (LR SYNC FOR READOUT). Set SCOPE switch on XY Interface Panel to DIFF S. Set oscilloscope MODE switch to A + B. Set oscilloscope B switch to INVERT DC. On XY Interface panel set FREQ + PHASE switch to OFF. Measure and record the oscilloscope indications of A through F. (See Figure 1.) LR RANGE DATA ACQUISITION TEST 36. Perform the following DSKY operations: a. VERB 14 NOUN 01 ENTR b. Address of LR Range data 03437 ENTR c. Observe Row 1 indicates 00011 d. Observe Row 2 indicates 37653 READ CYCLE TIMING TEST LR V Z 37. Reset Frequency Counter. Set XY Interface Panel switches as follows: CHANNEL T to 219 (LR V Z GATE STROBE) and FREQ + PHASE to FR T-T-T. 38. Enter VERB 33 and press the ENTR pushbutton on the DSKY. Record the Frequency Counter indications. Set FREQ + PHASE switch on XY Interface panel to OFF. DATE 15 MAR 66		

JOB LGC OUTPUT TEST		JDC 12621 REV D PAGE 6 OF 9
SUBSYSTEM LEM G & N SYSTEM		ASSY
LR V Z GATE STROBE TIMING TEST 39. Set the CHANNEL 8 switches to 118. Set oscilloscope MODE switch to ALT. Set oscilloscope B switch to NORM DC. Set SCOPE switch on XY Interface Panel to ALTERNATE S-T. 40. Determine and record the timing lag of a LR V Z Gate Strobe pulse (T-219) to a LR Reset Strobe pulse (S-118) at their respective A/2 points. LR V Z GATE STROBE TEST 41. Set SCOPE switch on XY Interface Panel to DIFF T. Set oscilloscope MODE switch to A + B. Set oscilloscope B switch to INVERT DC. Measure and record oscilloscope indications of A through F of Figure 1. LR V Z DATA ACQUISITION TEST NOTE: DSKY display shown in parenthesis in step 42 is applicable to Program Aurora 88 only. 42. Perform the following DSKY operations: a. VERB 14 NOUN 01 ENTR b. Address of V Z data 03437 ENTR c. Observe Row 1 indicates 00001 d. Observe Row 2 indicates 10437 (07777) LR V Z READ CYCLE TIMING TEST 43. Reset Frequency Counter. Set XY Interface Panel switches as follows: CHANNEL T to 218 (LR V Z GATE STROBE), CHANNEL 8 to 314, and FREQ + PHASE to FR T-T-T. 44. Enter VERB 33 and press the ENTR pushbutton on the DSKY. Record the Frequency Counter indication. Set the FREQ + PHASE switch on the XY Interface panel to OFF. LR V Z GATE STROBE TIMING TEST 45. Set the CHANNEL 8 switches to 118. Set oscilloscope MODE switch to ALT. Set oscilloscope B switch to NORM DC. Set SCOPE switch on XY Interface Panel to ALTERNATE S-T. 46. Determine and record the timing lag of a LR V Z Gate Strobe pulse (T-218) to a LR Reset Strobe pulse (S-118) at their respective A/2 points. LR V Z STROBE TEST 47. Repeat step 41. LR V Z DATA ACQUISITION TEST NOTE: DSKY display shown in parenthesis in step 48 is applicable to Program Aurora 88 only. 48. Perform the following DSKY operations: a. VERB 14 NOUN 01 ENTR b. Address of V Z data 03437 ENTR 49. Perform the following DSKY operations: a. VERB 14 NOUN 01 ENTR b. Address of V Z data 03437 ENTR DATE 15 MAR 66		

JOB LGC OUTPUT TEST		JDC 12621 REV D PAGE 7 OF 9
SUBSYSTEM LEM G & N SYSTEM		ASSY
c. Observe Row 1 indicates 00001 d. Observe Row 2 indicates 10437 (07777) LR V X READ CYCLE TIMING TEST 49. Reset Frequency Counter. Set XY Interface Panel switches as follows: CHANNEL T to 217 (LR V X GATE STROBE), CHANNEL 8 to 314, and FREQ + PHASE to FR T-T-T. 50. Enter VERB 33 and press the ENTR pushbutton on the DSKY. Record the Frequency Counter indication. Set FREQ + PHASE switch on XY Interface panel to OFF. LR V X GATE STROBE TIMING TEST 51. Set the CHANNEL 8 switches to 118. Set oscilloscope MODE switch to ALT. Set oscilloscope B switch to NORM DC. Set SCOPE switch on XY Interface Panel to ALTERNATE S-T. 52. Determine and record the timing lag of a LR V X Gate Strobe pulse (T-217) to a LR Reset Strobe pulse (S-118) at their respective A/2 points. LR V X GATE STROBE TEST 53. Repeat step 41. LR V X DATA ACQUISITION TEST NOTE: DSKY display shown in parenthesis in step 54 is applicable to Program Aurora 88 only. 54. Perform the following DSKY operations: a. VERB 14 NOUN 01 ENTR b. Address of V X data 03437 ENTR c. Observe Row 1 indicates 00001 d. Observe Row 2 indicates 10437 (07777) RR RANGE RATE READ CYCLE TIMING TEST 55. Reset Frequency Counter. Set XY Interface Panel switches as follows: CHANNEL T to 216 (RR RANGE RATE STROBE), CHANNEL 8 to 313, and FREQ + PHASE to FR T-T-T. 56. Enter VERB 33 and press the ENTR pushbutton on the DSKY. Record the Frequency Counter indications. Set FREQ + PHASE switch on XY Interface panel to OFF. RR RANGE RATE GATE STROBE TIMING TEST 57. Set the CHANNEL 8 switches to 105. Set oscilloscope MODE switch to ALT. Set oscilloscope B switch to NORM DC. Set SCOPE switch on XY Interface Panel to ALTERNATE S-T. 58. Determine and record the timing lag of a RR Range Rate Gate Strobe pulse (T2:6) to a RR Reset Strobe pulse (S-105) at their respective A/2 points. RR RANGE RATE GATE STROBE TEST 59. Repeat step 41. DATE 15 MAR 66		

JOB LGC OUTPUT TEST		JDC 12621 REV D PAGE 8 OF 9
SUBSYSTEM LEM G & N SYSTEM		ASSY
RR RANGE RATE DATA ACQUISITION TEST 60. Perform the following DSKY operations: a. VERB 14 NOUN 01 ENTR b. Address of RR Range data 03437 ENTR c. Observe Row 1 indicates 00017 d. Observe Row 2 indicates 37770 61. Reset Frequency Counter. Set XY Interface Panel switches as follows: CHANNEL T to 215 (RR RANGE GATE STROBE), CHANNEL 8 to 313 (RR SYNC FOR READOUT), and FREQ + PHASE switch to FR T-T-T. 62. Enter VERB 33 and press the ENTR pushbutton on the DSKY. Record the Frequency Counter indication. Set FREQ + PHASE switch on XY Interface panel to OFF. RR SYNC FOR READOUT STROBE TEST 63. Set oscilloscope MODE switch to ALT. Set oscilloscope B switch to NORM DC. Set SCOPE switch on XY Interface Panel to ALTERNATE S-T. Measure and record the oscilloscope indications of A through F of Figure 1. RR RANGE GATE STROBE TIMING TEST 64. Set the CHANNEL 8 switches to 106. 65. Determine and record the timing lag of a RR Range Gate Strobe pulse (T-215) to a RR Reset Strobe pulse (S-106) at their respective A/2 points. RR RANGE GATE STROBE TEST 66. Repeat step 41. RR RANGE DATA ACQUISITION TEST 67. Perform the following DSKY operations: a. VERB 14 NOUN 01 ENTR b. Address of RR Range data 03437 ENTR c. Observe Row 1 indicates 00017 d. Observe Row 2 indicates 37770 68. Deactivate all switches on the XY Interface Panel. Enter VERB 36 and press the ENTR pushbutton on the DSKY. DOWN LINK TELEMETRY TEST 69. Perform the following DSKY operations: a. VERB 31 NOUN 01 ENTR b. 01750 ENTR c. 11753 ENTR d. NOUN 15 ENTR e. 01755 ENTR f. 04353 ENTR g. 00100 ENTR h. 77777 ENTR i. 55753 ENTR j. 31754 ENTR DATE 15 MAR 66		



JOB LGC OUTPUT TEST

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SUBSYSTEM LEM G & N SYSTEM

ASSY

1. 55000 ENTR ENTR

1. 25757 ENTR ENTR

m. 01750 ENTR

n. NOUN 01 ENTR

o. 00411 ENTR

p. 01000 ENTR

q. VERB 25 NOUN 26 ENTR

r. 04000 ENTR

s. 01750 ENTR

t. 00003 ENTR

u. VERB 30 ENTR

v. VERB 01 NOUN 01 ENTR

w. 01000 ENTR

x. Observe

Row 1 indicates 77777

y. NOUN 01 ENTR

z. 01077 ENTR

aa. Observe

Row 1 indicates 77777

If Row 1 does not indicate 77777, repeat step 69.

70. Make the following switch settings on the XY Interface Panel:

a. DL ENABLE pushbutton - press to light

b. WORD RATE 50 PPS pushbutton - press to light

c. Press 200 OHM LOAD pushbuttons for CHANNEL 8 and CHANNEL T. Set oscilloscope MODE switch to A+B. Set oscilloscope B switch to INVERT DC.

d. SCOPE switch to DIFF T.

71. Set the CHANNEL T switches to 102 (DLNK DATA). Measure and record the oscilloscope indications of A through E. (See Figure 1.)

72. Set the CHANNEL 8 switches to 307 (DLNK SYNC). Set oscilloscope MODE switch to ALT. Measure and record the delay of the DLNK DATA pulse with respect to the DLNK SYNC pulse.

73. Press the WORD RATE 10 PPS pushbutton, the pushbutton shall light. Press the WORD RATE 50 PPS pushbutton, the pushbutton shall go out. Set oscilloscope MODE switch to A-B. Set B switch to INVERT

DC. Set SCOPE switch on XY Interface Panel to DIFF T. Repeat step 71.

74. Press the WORD RATE 300 PPS pushbutton, the pushbutton shall light. Press the WORD RATE 10 PPS pushbutton, the pushbutton shall go out.

NOTE: The PROG alarm on the DSKY shall light.

75. Perform the following DSKY operations:

a. VERB 01 NOUN 10 ENTR

b. 00033 ENTR

c. Observe

Row 1 indicates X3XXX

76. Press the DL ENABLE pushbutton. Set the CHANNEL 8 and T switches to 111. Press the WORD RATE 300 PPS pushbutton, the pushbutton shall go out.

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APOLLO G&N  
EQUIPMENT TEST  
DATA SHEET 1 OF 7

JOB LGC OUTPUT TEST

JDC NO. 12821  
REV. D  
INITIAL TORR 27134

ASSEMBLY UNDER TEST

TITLE \_\_\_\_\_ DATE \_\_\_\_\_ START \_\_\_\_\_ END \_\_\_\_\_ SITE / LOCATION \_\_\_\_\_

SER. NO. \_\_\_\_\_ DWG. \_\_\_\_\_ REV. \_\_\_\_\_ TIME \_\_\_\_\_ START \_\_\_\_\_ END \_\_\_\_\_ TOTAL ELAPSED \_\_\_\_\_

MAJOR GROUND SUPPORT EQUIPMENT

NAME \_\_\_\_\_ SER. NO. \_\_\_\_\_ CAL DATE \_\_\_\_\_

NAME \_\_\_\_\_ SER. NO. \_\_\_\_\_ CAL DATE \_\_\_\_\_

CONDUCTED BY \_\_\_\_\_ NAME / AFFILIATION \_\_\_\_\_ APPROVED BY \_\_\_\_\_ NAME / AFFILIATION \_\_\_\_\_

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ ACC
4.a	RCS Jet -X4U	vdc	2.0		5.0	
4.b	RCS Jet +X4D	vdc	2.0		5.0	
4.c	RCS Jet -X3U	vdc	2.0		5.0	
4.d	RCS Jet +X3D	vdc	2.0		5.0	
4.e	RCS Jet -X2U	vdc	2.0		5.0	
4.f	RCS Jet +X2D	vdc	2.0		5.0	
4.g	RCS Jet -X1U	vdc	2.0		5.0	
4.h	RCS Jet +X1D	vdc	2.0		5.0	
6	RCS Jet -X4U	vdc	9.0		11.0	
	RCS Jet +X4D	vdc	9.0		11.0	
	RCS Jet -X3U	vdc	9.0		11.0	
	RCS Jet +X3D	vdc	9.0		11.0	
	RCS Jet -X2U	vdc	9.0		11.0	
	RCS Jet +X2D	vdc	9.0		11.0	
	RCS Jet -X1U	vdc	9.0		11.0	
	RCS Jet +X1D	vdc	9.0		11.0	
7.a	RCS Jet +Z3F	vdc	2.0		5.0	
7.b	RCS Jet -Z4F	vdc	2.0		5.0	

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CHG 3 2-66

APOLLO G&N  
EQUIPMENT TEST  
DATA SHEET 2 OF 7

JOB LGC OUTPUT TEST

APOLLO G&N  
EQUIPMENT TEST  
DATA SHEET 3 OF 7

JOB LGC OUTPUT TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ / CC
7.c	RCS Jet -Z1F	vdc	2.0		5.0	
7.d	RCS Jet +Z2F	vdc	2.0		5.0	
7.e	RCS Jet +Y2S	vdc	2.0		5.0	
7.f	RCS Jet -Y3S	vdc	2.0		5.0	
7.g	RCS Jet -Y4S	vdc	2.0		5.0	
7.h	RCS Jet -Y1S	vdc	2.0		5.0	
9.a	RCS Jet +Z3F	vdc	9.0		11.0	
9.b	RCS Jet -Z4F	vdc	9.0		11.0	
9.c	RCS Jet -Z1F	vdc	9.0		11.0	
9.d	RCS Jet +Z2F	vdc	9.0		11.0	
9.e	RCS Jet +Y2S	vdc	9.0		11.0	
9.f	RCS Jet -Y3S	vdc	9.0		11.0	
9.g	RCS Jet -Y4S	vdc	9.0		11.0	
9.h	RCS Jet -Y1S	vdc	9.0		11.0	
10	Eng On	vdc	2.0		5.0	
12	Eng On	vdc	2.0		5.0	
	Eng Off	vdc	9.0		11.0	
13.a	+Pitch Gimbal Trim	vdc	2.0		5.0	
13.b	-Pitch Gimbal Trim	vdc	2.0		5.0	
13.c	+Roll Gimbal Trim	vdc	2.0		5.0	
13.d	-Roll Gimbal Trim	vdc	2.0		5.0	
16	+Pitch Gimbal Trim	vdc	9.0		11.0	
	-Pitch Gimbal Trim	vdc	9.0		11.0	
	+Roll Gimbal Trim	vdc	9.0		11.0	
	-Roll Gimbal Trim	vdc	9.0		11.0	
18A	Amplitude	volts	4.0		10.0	

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JDC  
NO. 12821  
REV. D

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ ACC
18B	Pulse Width	u sec	2.0		4.0	
18C	Drop	volts			A/5	
18D	Rise Time	u sec			0.20	
18E	Backsawing	volts			4.0	
18F	Noise	P-PV	0		0.4	
20A	Amplitude	volts	4.0		10.0	
20B	Pulse Width	u sec	2.0		4.0	
20C	Drop	volts			A/5	
20D	Rise Time	u sec			0.20	
20E	Backsawing	volts			4.0	
20F	Noise	P-PV	0		0.4	
22.a.A	Amplitude	volts	4.0		10.0	
22.a.B	Pulse Width	u sec	2.0		4.0	
22.a.C	Drop	volts			A/5	
22.a.D	Rise Time	u sec			0.2	
22.a.E	Backsawing	volts			4.0	
22.b.A	Amplitude	volts	4.0		10.0	
22.b.B	Pulse Width	u sec	2.0		4.0	
22.b.C	Drop	volts			A/5	
22.b.D	Rise Time	u sec			0.2	
22.b.E	Backsawing	volts			4.0	
24.a.A	Amplitude	volts	4.0		10.0	
24.a.B	Pulse Width	u sec	2.0		4.0	
24.a.C	Drop	volts			A/5	
24.a.D	Rise Time	u sec			.2	
24.a.E	Backsawing	volts			4.0	
24.b.A	Amplitude	volts	4.0		10.0	
24.b.B	Pulse Width	u sec	2.0		4.0	

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CHG 3 2-66



APOLLO G&N  
EQUIPMENT TEST  
DATA SHEET 4 OF 7  
JOB LGC OUTPUT TEST

JDC  
NO. 12621  
REV. D

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ ACC
24.b.C	Droop	volts			A/5	
24.b.D	Rise Time	u sec			.2	
24.b.E	Backsawing	volts			4.0	
26.a.A	Amplitude	volts	4.0		10.0	
26.a.B	Pulse Width	u sec	2.0		4.0	
26.a.C	Droop	volts			A/5	
26.a.D	Rise Time	u sec			.2	
26.a.E	Backsawing	volts			4.0	
26.a.F	Noise	volts	0		.4	
26.b.A	Amplitude	volts	4.0		10.0	
26.b.B	Pulse Width	u sec	2.0		4.0	
26.b.C	Droop	volts			A/5	
26.b.D	Rise Time	u sec			.2	
26.b.E	Backsawing	volts			4.0	
26.b.F	Noise	volts	0		.4	
31.	LR Range Read Cycle Timing	m sec	80.315			
32.A	Amplitude	volts	4.0		10.0	
32.B	Pulse Width	u sec	2.0		4.0	
32.C	Droop	volts			A/5	
32.D	Rise Time	u sec			0.20	
32.E	Backsawing	volts			4.0	
32.F	Noise	volts	0		0.4	
34	LR Range Gate Strobe Timing	u sec	1.75		2.25	
35.A	Amplitude	volts	4.0		10.0	
35.B	Pulse Width	u sec	2.0		4.0	

DATE

FORM 00155  
MAR 63

APOLLO G&N  
EQUIPMENT TEST  
DATA SHEET 5 OF 7  
JOB LGC OUTPUT TEST

JDC  
NO. 12621  
REV. D

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ ACC
35.C	Droop	volts			A/5	
35.D	Rise Time	u sec			0.20	
35.E	Backsawing	volts			4.0	
35.F	Noise	volts	0		0.4	
38	LR V <sub>Z</sub> Read Cycle Timing	m sec	80.315			
40	LR V <sub>Z</sub> Gate Strobe Timing	u sec	1.75		2.25	
41.A	Amplitude	volts	4.0		10.0	
41.B	Pulse Width	u sec	2.0		4.0	
41.C	Droop	volts			A/5	
41.D	Rise Time	u sec			0.20	
41.E	Backsawing	volts			4.0	
41.F	Noise	volts	0		0.4	
44	LR V <sub>Y</sub> Read Cycle Timing	m sec	80.315			
46	LR V <sub>Y</sub> Gate Strobe Timing	u sec	1.75		2.25	
47.A	Amplitude	volts	4.0		10.0	
47.B	Pulse Width	u sec	2.0		4.0	
47.C	Droop	volts			A/5	
47.D	Rise Time	u sec			.20	
47.E	Backsawing	volts			4.0	
47.F	Noise	volts	0		0.4	
50	LR V <sub>X</sub> Read Cycle Timing	m sec	80.315			
52	LR V <sub>X</sub> Gate Strobe Timing	u sec	1.75		2.25	

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APOLLO G&N  
EQUIPMENT TEST  
DATA SHEET 6 OF 7  
JOB LGC OUTPUT TEST

JDC  
NO. 12621  
REV. D

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ ACC
53.A	Amplitude	volts	4.0		10.0	
53.B	Pulse Width	u sec	2.0		4.0	
53.C	Droop	volts			A/5	
53.D	Rise Time	u sec			0.2	
53.E	Backsawing	volts			4.0	
53.F	Noise	P-PV	0		0.4	
56	RR Range Rate Read Cycle Timing	m sec	80.935			
58	RR Range Rate Gate Strobe Timing	u sec	1.75		2.25	
59.A	Amplitude	volts	4.0		10.0	
59.B	Pulse Width	u sec	2.0		4.0	
59.C	Droop	volts			A/5	
59.D	Rise Time	u sec			0.2	
59.E	Backsawing	volts			4.0	
59.F	Noise	P-PV	0		0.4	
62	RR Range Read Cycle Timing	m sec	80.935			
63.A	Amplitude	volts	4.0		10.0	
63.B	Pulse Width	u sec	2.0		4.0	
63.C	Droop	volts			A/5	
63.D	Rise Time	u sec			0.2	
63.E	Backsawing	volts			4.0	
63.F	Noise	P-PV	0		0.4	
65	RR Range Gate Strobe Timing	u sec	1.75		2.25	
66.A	Amplitude	volts	4.0		10.0	
66.B	Pulse Width	u sec	2.0		4.0	
66.C	Droop	volts			A/5	

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APOLLO G&N  
EQUIPMENT TEST  
DATA SHEET 7 OF 7  
JOB LGC OUTPUT TEST

JDC  
NO. 12621  
REV. D

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ ACC
66.D	Rise Time	u sec			.20	
66.E	Backsawing	volts			4.0	
66.F	Noise	PP-V	0		0.4	
71.A	Amplitude	volts	4.0		10.0	
71.B	Pulse Width	u sec	2.0		4.0	
71.C	Droop	volts			A/5	
71.D	Rise Time	u sec			0.2	
71.E	Backsawing	volts			4.0	
72	DLNK Data Sync Delay Time	u sec			1 u sec	
73.A	Amplitude	volts	5.0		9.0	
73.B	Pulse Width	u sec	2.0		6.0	
73.C	Droop	volts			A/5	
73.D	Rise Time	u sec			0.2	
73.E	Backsawing	volts			4.0	

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DESCRIPTION This test is designed to check the discrete outputs of the RCS jet and SCS command interface, and the pulse train outputs of the Main Engine command, Altitude meter, Landing Radar, Rendezvous Radar and Downlink interface.

Rev.	Date	TDRR NO.	PAGES REVISED	APPROVAL	REFERENCES
A	8-10-66	30551	All	MIT	NASA
B	10-6-66	31443	2-9	EA	PS 6015000, JDC 12613
C	11-25-66	32052	2-9	EA	IMPORTANT
D	6-30-67	34038	All	EA	1, 2, 3, 7
E	8-10-67	34336	1, 8	EA	INTERVAL
					TOOLS AND MATERIAL

- IMPORTANT: 1. In some steps the DSKY operations and displays required when the LGC contains Program Aurora 88 (2021101-021) are different from the DSKY operations and displays required when the LGC contains Program Aurora 85 (2021101-011). These differences are noted within the procedures.
2. Insure that connector assembly (2003099) is removed and W228-P1 is connected to the LGC test connector before proceeding
1. Perform JDC 12613 to establish a Master Initialization condition. Place system in ISS Standby condition.
2. Set the VOLTAGE SELECT on the Power Control panel to RDC. Set the switches on RDC Interface panel as follows:
- a. DE MARGINS to NORM
  - b. CHAN V METERS to DCVM
  - c. CHANNEL V selector to 601
3. Perform the following DSKY operations:
- a. VERB 57 ENTR
  - b. 00011 ENTR
  - c. Observe Row 2 indicates 00377
  - d. Observe Row 2 indicates 00377

VERIFICATION WITH SIDL REQUIRED BEFORE USE  
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RCS JET ON-OFF TEST  
4. Set the CHANNEL V selectors to the positions specified below and record the DCVM indications for each position.

CHANNEL V	RCS JET
a. 601	-X4U
b. 602	+X4D
c. 603	-X3U
d. 604	+X3D
e. 605	-X2U
f. 606	+X2D
g. 607	-X1U
h. 608	+X1D

5. Press the ENTR pushbutton on the DSKY. Observe Row 1 indicates 00006 and Row 2 indicates 00377.

6. Repeat step 4.

7. Set the CHANNEL V selectors to the positions specified below and record the DCVM indications for each position.

CHANNEL V	RCS JET
a. 609	+Z3F
b. 610	-Z4F
c. 611	-Z1F
d. 612	+Z2F
e. 613	+Y2S
f. 614	-Y3S
g. 615	-Y4S
h. 616	-Y1S

8. Press the ENTR pushbutton on the DSKY. Observe Row 1 indicates 00011 and Row 2 indicates 30000.

9. Repeat step 7.

ENG ON-OFF ASC OR DESC TEST  
10. Set the CHANNEL V selectors to 506 (ENG ON, ASC OR DESC) and 520 (ENG OFF, ASC OR DESC). Record the DCVM indications for each position.

11. Press the ENTR pushbutton on the DSKY. Observe Row 1 indicates 00012 and Row 2 indicates 37400.

12. Set the CHANNEL V selectors to 506 and 520. Record the DCVM indications for each position.

PITCH-ROLL GIMBAL TRIM TESTS

13. Set the CHANNEL V selectors to the positions specified below and record the DCVM indications for each position.

CHANNEL V	GIMBAL TRIM
a. 406	+Pitch
b. 501	-Pitch
c. 504	+Roll
d. 617	-Roll

14. Observe that the RR AUTO ANGLE ENABLE and LR HOVER POS COM lamps on the Monitor Panel are lighted.

15. Press the ENTR pushbutton on the DSKY.

16. Repeat step 13. Observe that the lamps specified in step 14 are not lighted. Set the CHANNEL V selectors to 101.

INC AND DEC THROTTLE RATE DESC ENG TEST

17. Make following switch settings and connections:

- a. On XY Interface Panel set 1. SCOPE switch to DIFF T.

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2. CHANNEL T to 213 (INC THROTTLE RATE DESCENT ENGINE)

3. LOAD CHAN T 200 OHMS - press to test

b. Connect coax jumpers as follows:

1. From SCOPE A on XY Interface Panel to Oscilloscope Channel A input jack.

2. From SCOPE A on XY Interface Panel to Oscilloscope EXT TRIG input jack.

3. From SCOPE B on XY Interface Panel to Oscilloscope Channel B input jack.

c. On Oscilloscope set

1. SOURCE switch to EXT.

2. MODE switch to A + B.

3. Scope B switch to INVERT DC.

18. Measure and record the oscilloscope indications of A through F. (See Figure 1.)

19. Press the ENTR pushbutton on the DSKY. The signal on the oscilloscope shall disappear.

20. Set the CHANNEL T switches to 214 (DEC THROTTLE RATE DESC ENGINE). Measure and record the oscilloscope indications of A through F. (See Figure 1.)

21. Press the ENTR pushbutton on the DSKY. The signal on the oscilloscope shall disappear.

ALTITUDE "1", ALTITUDE "0" TEST

22. Set the CHANNEL T switches to 317

(ALTITUDE "1") and 318 (ALTITUDE "0").

Measure and record the oscilloscope indications of A through E for each position. (See Figure 1.)

23. Press the ENTR pushbutton on the DSKY. Set the CHANNEL T switches to 317 and 318 and observe that the signals on the oscilloscope have disappeared for each position.

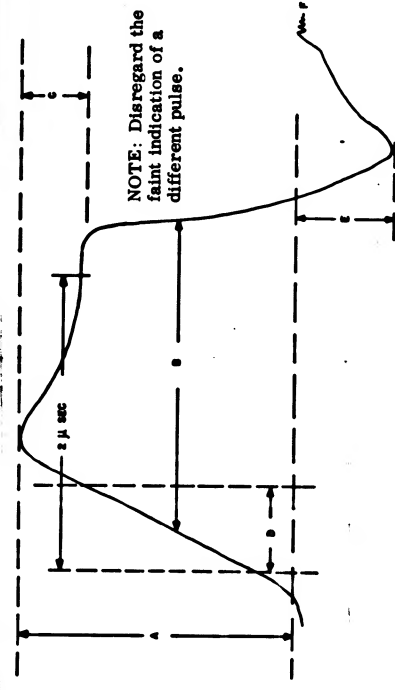
24. Set CHANNEL T switches to 319 (ALTITUDE RATE "1") and 320 (ALTITUDE RATE "0"). Measure and record the oscilloscope indications of A through E for each position. (See Figure 1.)

25. Press the ENTR pushbutton on the DSKY. Set the CHANNEL T switches to 319 and 320 and observe that the signal on the oscilloscope disappears for each position. RR AND LR RESET STROBE TEST

26. Press the LOAD CHAN S 200 OHMS pushbutton on the XY Interface Panel to ON. Set the SCOPE switch to DIFF 8.

Set the CHANNEL S switches to 105 (RR RESET STROBE) and 118 (LR RESET STROBE) and measure and record the oscilloscope indications of A through F for each position. (See Figure 1.)

LR RANGE READ CYCLE TIMING TEST  
27. Set the CHANNEL T switches to 220 (LR RANGE GATE STROBE) and CHANNEL S switches to 314 (LR SYNC FOR READ-OUTS).



A - Amplitude: measured to pulse maximum positive level  
B - Pulse width: measured at A/2 level  
C - Drop: measured from pulse maximum positive level to level at 2 microseconds  
D - Rise Time: time required for pulse to rise from 10% to 90% of A  
E - Backsawing: measured to signal maximum negative level  
F - Noise: (No Pulse)

Figure 1. Waveform Description

28. Set the FREQ + PHASE switch on the XY Interface Panel to FR T T-S. Connect a coax jumper to CNTR-A and FREQ AC on the Frequency Counter Panel. Connect a coax jumper to CNTR-B and STOP-B.

29. Set the Frequency Counter Panel controls as follows:

- a. INPUT VOLTS RMS selector to 6.4
- b. TRIGGER LEVEL control to mid range
- c. TIME selector to MS

- d. DISPLAY fully CCW but not into detent position
  - e. GATE switch to AUTO
  - f. FUNCTION switch to A-B
  - g. SLOPE to (+)
- NOTE: Disregard the PROG and TRACKER alarms during the following test.

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SUBSYSTEM	LEM G & N SYSTEM	ASSY
<p>30. Make the following switch settings on the AGC INPUT COUNTERS portion of the XY Interface Panel:</p> <ul style="list-style-type: none"> <li>a. Selector to 12</li> <li>b. STANDARD RATE pushbutton - press to light</li> <li>c. POSITIVE pushbutton - press to light</li> <li>d. OUT IN pushbutton - press to light</li> <li>e. Set C33-4, C33-5, C33-8 on RDC Panel.</li> </ul> <p>31. Press VERB 57 ENTR. 00014 ENTR VERB 33 ENTR. Record the counter indication.</p> <p>NOTE: If in the above step the counter did not count or did not indicate about 80 milliseconds, press RESET and adjust the INPUT VOLTS RMS and TRIGGER LEVEL controls concurrently until a repeatable or satisfactory indication is present.</p> <p><u>LR RANGE GATE STROBE TEST</u></p> <p>32. Set SCOPE switch on XY Interface Panel to DIFF T. Measure and record oscilloscope indications A through F. (See Figure 1.) After completing measurements, set SCOPE switch to ALTERNATE S→T, and oscilloscope MODE switch to ALT. Set oscilloscope B switch to NORMAL DC.</p> <p><u>LR RANGE GATE STROBE TIMING TEST</u></p> <p>33. Set the CHANNEL S switches to 118 (LR RESET STROBE).</p>	<p>34. Determine the timing lag of a LR Range Gate Strobe pulse (T-220) to a LR Reset Strobe pulse (S-118) at their respective A/2 points.</p> <p><u>LR SYNC FOR READOUT STROBE TEST</u></p> <p>35. Set the CHANNEL S switches to 314 (LR SYNC FOR READOUT). Set SCOPE switch on XY Interface Panel to DIFF S. Set oscilloscope MODE switch to A + B. Set oscilloscope B switch to INVERT DC. On XY Interface panel set FREQ + PHASE switch to OFF. Measure and record the oscilloscope indications of A through F. (See Figure 1.)</p> <p><u>LR RANGE DATA ACQUISITION TEST</u></p> <p>36. Perform the following DSKY operations:</p> <ul style="list-style-type: none"> <li>a. VERB 14 NOUN 01 ENTR</li> <li>b. Address of LR Range data 03437 ENTR</li> <li>c. Observe Row 1 indicates 00011</li> <li>d. Observe Row 2 indicates 37653</li> </ul> <p><u>READ CYCLE TIMING TEST LR V<sub>Z</sub></u></p> <p>37. Reset Frequency Counter. Set XY Interface Panel switches as follows:</p> <p>CHANNEL T to 219 (LR V<sub>Z</sub> GATE STROBE) and FREQ + PHASE to FR T → S.</p> <p>38. Enter VERB 33 and press the ENTR pushbutton on the DSKY. Record the Frequency Counter indications. Set FREQ + PHASE switch on XY Interface panel to OFF.</p>	<p>DATE 15 MAR 66</p>

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JOB	LGC OUTPUT TEST	JDC 12621 REV E PAGE 6 OF 9
SUBSYSTEM	LEM G & N SYSTEM	ASSY
<p><u>LR V<sub>Z</sub> GATE STROBE TIMING TEST</u></p> <p>39. Set the CHANNEL S switches to 118. Set oscilloscope MODE switch to ALT. Set oscilloscope B switch to NORM DC. Set SCOPE switch on XY Interface Panel to ALTERNATE S→T.</p> <p>40. Determine and record the Timing lag of a LR V<sub>Z</sub> Gate Strobe pulse (T-219) to a LR Reset Strobe pulse (S-118) at their respective A/2 points.</p> <p><u>LR V<sub>Z</sub> GATE STROBE TEST</u></p> <p>41. Set SCOPE switch on XY Interface Panel to DIFF T. Set oscilloscope MODE switch to A + B. Set oscilloscope B switch to INVERT DC. Measure and record oscilloscope indications of A through F of Figure 1.</p> <p><u>LR V<sub>Z</sub> DATA ACQUISITION TEST</u></p> <p>NOTE: DSKY display shown in parenthesis in step 42 is applicable to Program Aurora 88 only.</p> <p>42. Perform the following DSKY operations:</p> <p>a. VERB 14 NOUN 01 ENTR</p> <p>b. Address of V<sub>Z</sub> data 03437 ENTR</p> <p>c. Observe Row 1 indicates 00001</p> <p>d. Observe Row 2 indicates 10437 (07777)</p> <p><u>LR V<sub>Z</sub> READ CYCLE TIMING TEST</u></p> <p>43. Reset Frequency Counter. Set XY Interface Panel switches as follows:</p>	<p>CHANNEL T to 218 (LR V<sub>Z</sub> GATE STROBE), CHANNEL S to 314, and FREQ + PHASE to FR T → S.</p> <p>44. Enter VERB 33 and press the ENTR pushbutton on the DSKY. Record the Frequency Counter Indication. Set the FREQ + PHASE switch on the XY Interface panel to OFF.</p> <p><u>LR V<sub>Z</sub> GATE STROBE TIMING TEST</u></p> <p>45. Set the CHANNEL S switches to 118. Set oscilloscope MODE switch to ALT. Set oscilloscope B switch to NORM DC. Set SCOPE switch on XY Interface Panel to ALTERNATE S → T.</p> <p>46. Determine and record the timing lag of a LR V<sub>Z</sub> Gate Strobe pulse (T-219) to a LR Reset Strobe pulse (S-118) at their respective A/2 points.</p> <p><u>LR V<sub>Z</sub> STROBE TEST</u></p> <p>47. Repeat step 41.</p> <p><u>LR V<sub>Z</sub> DATA ACQUISITION TEST</u></p> <p>NOTE: DSKY display shown in parenthesis in step 48 is applicable to Program Aurora 88 only.</p> <p>48. Perform the following DSKY operations:</p> <p>a. VERB 14 NOUN 01 ENTR</p> <p>b. Address of V<sub>Z</sub> data 03437 ENTR</p>	

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SUBSYSTEM LEM G & N SYSTEM

ASSY

c. Observe

Row 1 indicates 00001

d. Observe

Row 2 indicates 10437 (07777)

LR V<sub>X</sub> READ CYCLE TIMING TEST

49. Reset Frequency Counter. Set XY

Interface Panel switches as follows:

CHANNEL T to 217 (LR V<sub>X</sub> GATE STROBE), CHANNEL S to 314, and FREQ + PHASE to FR T → S.

50. Enter VERB 33 and press the ENTR pushbutton on the DSKY. Record the Frequency Counter indication. Set FREQ + PHASE switch on XY Interface panel to OFF.

LR V<sub>X</sub> GATE STROBE TIMING TEST

51. Set the CHANNEL S switches to 118. Set oscilloscope MODE switch to ALT. Set oscilloscope B switch to NORM DC. Set SCOPE switch on XY Interface Panel to ALTERNATE S→T.

52. Determine and record the timing lag of a LR V<sub>X</sub> Gate Strobe pulse (T-217) to a LR Reset Strobe pulse (S-118) at their respective A/2 points.

LR V<sub>X</sub> GATE STROBE TEST

53. Repeat step 41.

LR V<sub>X</sub> DATA ACQUISITION TEST

NOTE: DSKY display shown in parenthesis in step 54 is applicable to Program Aurora 88 only.

54. Perform the following DSKY operations:

b. Address of

V<sub>X</sub>  
data 03437

ENTR

c. Observe  
Row 1 indicates 00001

d. Observe  
Row 2 indicates 10437 (07777)

RR RANGE RATE READ CYCLE TIMING TEST

55. Reset Frequency Counter. Set XY Interface Panel switches as follows:

CHANNEL T to 216 (RR RANGE RATE STROBE), CHANNEL S to 313, and FREQ + PHASE to FR T → S.

56. Enter VERB 33 and press the ENTR pushbutton on the DSKY. Record the Frequency Counter indications. Set FREQ + PHASE switch on XY Interface panel to OFF.

RR RANGE RATE GATE STROBE TIMING TEST

57. Set the CHANNEL S switches to 105. Set oscilloscope MODE switch to ALT. Set oscilloscope B switch to NORM DC. Set SCOPE switch on XY Interface Panel to ALTERNATE S→T.

58. Determine and record the timing lag of a RR Range Rate Gate Strobe pulse (T-216) to a RR Reset Strobe pulse (S-105) at their respective A/2 points.

RR RANGE RATE GATE STROBE TEST

59. Repeat step 41.

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SUBSYSTEM	LEM G & N SYSTEM	ASSY
<u>RR RANGE RATE DATA ACQUISITION TEST</u> 60. Perform the following DSKY operations: a. VERB 14 NOUN 01 ENTR b. Address of RR Range data 03437 ENTR c. Observe Row 1 indicates 77777 d. Observe Row 2 indicates 36627 <u>RR RANGE READ CYCLE TIMING TEST</u> 61. Reset Frequency Counter. Set XY Interface Panel switches as follows: CHANNEL T to 215 (RR RANGE GATE STROBE), CHANNEL S to 313 (RR SYNC FOR READOUT), and FREQ + PHASE switch to FR T T → S. 62. Enter VERB 33 and press the ENTR pushbutton on the DSKY. Record the Frequency Counter indication. Set FREQ + PHASE switch on XY Interface panel to OFF. <u>RR SYNC FOR READOUT STROBE TEST</u> 63. Repeat step 41. Measure and record the oscilloscope indications of A through F of Figure 1. <u>RR RANGE GATE STROBE TIMING TEST</u> 64. Set oscilloscope MODE switch to ALT. Set oscilloscope B switch to NORM DC. Set SCOPE switch on XY Interface Panel to ALTERNATE S → T and set the CHANNEL S switches to 105.		65. Determine and record the timing lag of a RR Range Gate Strobe pulse (T-215) to a RR Reset Strobe pulse (S-105) at their respective A/2 points. <u>RR RANGE GATE STROBE TEST</u> 66. Repeat step 41. <u>RR RANGE DATA ACQUISITION TEST</u> 67. Perform the following DSKY operations: a. VERB 14 NOUN 01 ENTR b. Address of RR Range data 03437 ENTR c. Observe Row 1 indicates 00017 d. Observe Row 2 indicates 37770 68. Deactivate all switches on the XY Interface Panel. Enter VERB 36 and press the ENTR pushbutton on the DSKY. <u>DOWN LINK TELEMETRY TEST</u> 69. Perform the following DSKY operations: a. VERB 21 NOUN 01 ENTR b. 01750 ENTR c. 11753 ENTR d. NOUN 15 ENTR e. 01755 ENTR f. 04353 ENTR g. 00100 ENTR h. 77777 ENTR i. 55753 ENTR j. 31754 ENTR

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ASSY

71. Set the CHANNEL T switches to 102 (DLNK DATA). Measure and record the oscilloscope indications of A through E. (See Figure 1.)

72. Set the CHANNEL S switches to 307 (DLNK SYNC). Set oscilloscope MODE switch to ALT. Measure and record the delay of the DLNK DATA pulse with respect to the DLNK SYNC pulse.

73. Press the WORD RATE 10 PPS pushbutton, the pushbutton shall light. Press the WORD RATE 50 PPS pushbutton, the pushbutton shall go out. Set oscilloscope MODE switch to A - B. Set B switch to INVERT DC. Set SCOPE switch on XY Interface Panel to DIFF T. Repeat step 71.

74. Press the WORD RATE 300 PPS pushbutton, the pushbutton shall light. Press the WORD RATE 10 PPS pushbutton, the pushbutton shall go out.

NOTE: The PROG alarm on the DSKY shall light.

75. Perform the following DSKY operations:

a. VERB 01 NOUN 10 ENTR

b. 00033 ENTR

c. Observe

Row 1 indicates X3XXX

76. Press the DL ENABLE pushbutton. Set the CHANNEL S and T switches to 101. Press the WORD RATE 300 PPS pushbutton, the pushbutton shall go out.

d. SCOPE switch to DIFF T.

70. Make the following switch settings on the XY Interface Panel:

a. DL ENABLE pushbutton - press to light

b. WORD RATE 50 PPS pushbutton - press to light

c. Press 200 OHM LOAD pushbuttons for CHANNEL S and CHANNEL T. Set oscilloscope MODE switch to A +B. Set oscilloscope B switch to INVERT DC.

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DATA SHEET 1 OF 7

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REV E  
INITIAL TORR 27134

JOB LGC OUTPUT TEST

ASSEMBLY UNDER TEST

TEST HISTORY

SER. NO. DWG REV.

DATE START END SITE / LOCATION  
TIME START END TOTAL ELAPSED

NAME SER. NO. CAL DATE

NAME SER. NO. CAL DATE

CONDUCTED BY NAME/AFFILIATION APPROVED BY NAME/AFFILIATION

MAJOR GROUND SUPPORT EQUIPMENT

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ ACC
4.a	RCS Jet -X4U	vdc	2.0		5.0	
4.b	RCS Jet +X4D	vdc	2.0		5.0	
4.c	RCS Jet -X3U	vdc	2.0		5.0	
4.d	RCS Jet +X3D	vdc	2.0		5.0	
4.e	RCS Jet -X2U	vdc	2.0		5.0	
4.f	RCS Jet +X2D	vdc	2.0		5.0	
4.g	RCS Jet -X1U	vdc	2.0		5.0	
4.h	RCS Jet +X1D	vdc	2.0		5.0	
6	RCS Jet -X4U	vdc	9.0		11.0	
	RCS Jet +X4D	vdc	9.0		11.0	
	RCS Jet -X3U	vdc	9.0		11.0	
	RCS Jet +X3D	vdc	9.0		11.0	
	RCS Jet -X2U	vdc	9.0		11.0	
	RCS Jet +X2D	vdc	9.0		11.0	
	RCS Jet -X1U	vdc	9.0		11.0	
	RCS Jet +X1D	vdc	9.0		11.0	
7.a	RCS Jet +Z3F	vdc	2.0		5.0	
7.b	RCS Jet -Z4F	vdc	2.0		5.0	

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EQUIPMENT TEST  
DATA SHEET 2 OF 7

JDC NO. 12621  
REV E

JOB LGC OUTPUT TEST

ASSEMBLY UNDER TEST

TEST HISTORY

SER. NO. DWG REV.

DATE START END SITE / LOCATION  
TIME START END TOTAL ELAPSED

NAME SER. NO. CAL DATE

NAME SER. NO. CAL DATE

CONDUCTED BY NAME/AFFILIATION APPROVED BY NAME/AFFILIATION

MAJOR GROUND SUPPORT EQUIPMENT

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ ACC
7.c	RCS Jet -Z1F	vdc	2.0		5.0	
7.d	RCS Jet +Z2F	vdc	2.0		5.0	
7.e	RCS Jet +Y2S	vdc	2.0		5.0	
7.f	RCS Jet -Y3S	vdc	2.0		5.0	
7.g	RCS Jet -Y4S	vdc	2.0		5.0	
7.h	RCS Jet -Y1S	vdc	2.0		5.0	
9.a	RCS Jet +Z3F	vdc	9.0		11.0	
9.b	RCS Jet -Z4F	vdc	9.0		11.0	
9.c	RCS Jet -Z1F	vdc	9.0		11.0	
9.d	RCS Jet +Z2F	vdc	9.0		11.0	
9.e	RCS Jet +Y2s	vdc	9.0		11.0	
9.f	RCS Jet -Y3S	vdc	9.0		11.0	
9.g	RCS Jet -Y4S	vdc	9.0		11.0	
9.h	RCS Jet -Y1s	vdc	9.0		11.0	
10	Eng On	vdc	2.0		5.0	
	Eng Off	vdc	2.0		5.0	
12	Eng On	vdc	9.0		11.0	
	Eng Off	vdc	9.0		11.0	
13.a	+Pitch Gimbal Trim	vdc	2.0		5.0	
13.b	-Pitch Gimbal Trim	vdc	2.0		5.0	
13.c	+Roll Gimbal Trim	vdc	2.0		5.0	
13.d	-Roll Gimbal Trim	vdc	2.0		5.0	
16	+Pitch Gimbal Trim	vdc	9.0		11.0	
	-Pitch Gimbal Trim	vdc	9.0		11.0	
	+Roll Gimbal Trim	vdc	9.0		11.0	
	-Roll Gimbal Trim	vdc	9.0		11.0	
18A	Amplitude	volts	4.0		10.0	

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APOLLO G&N  
EQUIPMENT TEST  
DATA SHEET 3 OF 7

JDC NO. 12621  
REV E

JOB LGC OUTPUT TEST

ASSEMBLY UNDER TEST

TEST HISTORY

SER. NO. DWG REV.

DATE START END SITE / LOCATION  
TIME START END TOTAL ELAPSED

NAME SER. NO. CAL DATE

NAME SER. NO. CAL DATE

CONDUCTED BY NAME/AFFILIATION APPROVED BY NAME/AFFILIATION

MAJOR GROUND SUPPORT EQUIPMENT

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ ACC
18B	Pulse Width	u sec	2.0		4.0	
18C	Drop	volts			A/5	
18D	Rise Time	u sec			0.20	
18E	Backsawing	volts			4.0	
18F	Noise	P-PV	0		0.4	
20A	Amplitude	volts	4.0		10.0	
20B	Pulse Width	u sec	2.0		4.0	
20C	Drop	volts			A/5	
20D	Rise Time	u sec			0.20	
20E	Backsawing	volts			4.0	
20F	Noise	P-PV	0		0.4	
22.a.A	Amplitude	volts	4.0		10.0	
22.a.B	Pulse Width	u sec	2.0		4.0	
22.a.C	Drop	volts			A/5	
22.a.D	Rise Time	u sec			0.2	
22.a.E	Backsawing	volts			4.0	
22.b.A	Amplitude	volts	4.0		10.0	
22.b.B	Pulse Width	u sec	2.0		4.0	
22.b.C	Drop	volts			A/5	
22.b.D	Rise Time	u sec			0.2	
22.b.E	Backsawing	volts			4.0	
24.a.A	Amplitude	volts	4.0		10.0	
24.a.B	Pulse Width	u sec	2.0		4.0	
24.a.C	Drop	volts			A/5	
24.a.D	Rise Time	u sec			.2	
24.a.E	Backsawing	volts			4.0	
24.b.A	Amplitude	volts	4.0		10.0	
24.b.B	Pulse Width	u sec	2.0		4.0	

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EQUIPMENT TEST  
DATA SHEET 4 OF 7

JDC  
NO. 12621  
REV. F

JOB LGC OUTPUT TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ ACC
24.b.C	Droop	volts			A/5	
24.b.D	Rise Time	u sec			.2	
24.b.E	Backsawing	volts			4.0	
26.a.A	Amplitude	volts	4.0		10.0	
26.a.B	Pulse Width	u sec	2.0		4.0	
26.a.C	Droop	volts			A/5	
26.a.D	Rise Time	u sec			.2	
26.a.E	Backsawing	volts			4.0	
26.a.F	Noise	volts	0		.4	
26.b.A	Amplitude	volts	4.0		10.0	
26.b.B	Pulse Width	u sec	2.0		4.0	
26.b.C	Droop	volts			A/5	
26.b.D	Rise Time	u sec			.2	
26.b.E	Backsawing	volts			4.0	
26.b.F	Noise	volts	0		.4	
31.	LR Range Read Cycle Timing	m sec	80.315			
32.A	Amplitude	volts	4.0		10.0	
32.B	Pulse Width	u sec	2.0		4.0	
32.C	Droop	volts			A/5	
32.D	Rise Time	u sec			0.20	
32.E	Backsawing	volts			4.0	
32.F	Noise	volts	0		0.4	
34	LR Range Gate Strobe Timing	u sec	1.75		2.25	
35.A	Amplitude	volts	4.0		10.0	
35.B	Pulse Width	u sec	2.0		4.0	

DATE

APOLLO G8N  
EQUIPMENT TEST  
DATA SHEET 5 OF 7

JDC  
NO. 12621  
REV. E

JOB LGC OUTPUT TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ ACC
35.C	Droop	volts			A/5	
35.D	Rise Time	u sec			0.20	
35.E	Backsawing	volts			4.0	
35.F	Noise	volts	0		0.4	
38	LR V <sub>Z</sub> Read Cycle Timing	m sec	80.315			
40	LR V <sub>Z</sub> Gate Strobe Timing	u sec	1.75		2.25	
41.A	Amplitude	volts	4.0		10.0	
41.B	Pulse Width	u sec	2.0		4.0	
41.C	Droop	volts			A/5	
41.D	Rise Time	u sec			0.20	
41.E	Backsawing	volts			4.0	
41.F	Noise	volts	0		0.4	
44	LR V <sub>Y</sub> Read Cycle Timing	m sec	80.315			
46	LR V <sub>Y</sub> Gate Strobe Timing	u sec	1.75		2.25	
47.A	Amplitude	volts	4.0		10.0	
47.B	Pulse Width	u sec	2.0		4.0	
47.C	Droop	volts			A/5	
47.D	Rise Time	u sec			.20	
47.E	Backsawing	volts			4.0	
47.F	Noise	volts	0		0.4	
50	LR V <sub>X</sub> Read Cycle Timing	m sec	80.315			
52	LR V <sub>X</sub> Gate Strobe Timing	u sec	1.75		2.25	

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EQUIPMENT TEST  
DATA SHEET 6 OF 7

JDC  
NO. 12621  
REV. E

JOB LGC OUTPUT TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ ACC
53.A	Amplitude	volts	4.0		10.0	
53.B	Pulse Width	u sec	2.0		4.0	
53.C	Droop	volts			A/5	
53.D	Rise Time	u sec			0.2	
53.E	Backsawing	volts			4.0	
53.F	Noise	P-PV	0		0.4	
56	RR Range Rate Read Cycle Timing	m sec	80.935			
58	RR Range Rate Gate Strobe Timing	u sec	1.75		2.25	
59.A	Amplitude	volts	4.0		10.0	
59.B	Pulse Width	u sec	2.0		4.0	
59.C	Droop	volts			A/5	
59.D	Rise Time	u sec			0.2	
59.E	Backsawing	volts			4.0	
59.F	Noise	P-PV	0		0.4	
62	RR Range Read Cycle Timing	m sec	80.935			
63.A	Amplitude	volts	4.0		10.0	
63.B	Pulse Width	u sec	2.0		4.0	
63.C	Droop	volts			A/5	
63.D	Rise Time	u sec			0.2	
63.E	Backsawing	volts			4.0	
63.F	Noise	P-PV	0		0.4	
65	RR Range Gate Strobe Timing	u sec	1.75		2.25	
66.A	Amplitude	volts	4.0		10.0	
66.B	Pulse Width	u sec	2.0		4.0	
66.C	Droop	volts			A/5	

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EQUIPMENT TEST  
DATA SHEET 7 OF 7

JDC  
NO. 12621  
REV. E

JOB LGC OUTPUT TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ ACC
66.D	Rise Time	u sec			.20	
66.E	Backsawing	volts			4.0	
66.F	Noise	PP-V	0		0.4	
71.A	Amplitude	volts	4.0		10.0	
71.B	Pulse Width	u sec	2.0		4.0	
71.C	Droop	volts			A/5	
71.D	Rise Time	u sec			0.2	
71.E	Backsawing	volts			4.0	
72	DLNK Data Sync Delay Time	u sec			1 u sec	
73.A	Amplitude	volts	5.0		9.0	
73.B	Pulse Width	u sec	2.0		6.0	
73.C	Droop	volts			A/5	
73.D	Rise Time	u sec			0.2	
73.E	Backsawing	volts			4.0	

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DESCRIPTION This test is designed to check the discrete outputs of the RCS Jet and SCS command interface, and the pulse train outputs of the Main Engine command, Altitude meter, Landing Radar, Rendezvous Radar and Downlink Interface.

Rev.	Let.	Date	TDRR NO.	PAGES REVISED	APPROVAL	REFERENCES
A	8-10-68	30551	ALL	D.S.	MIT	NASA
B	10-6-68	31413	2-9	4-6	EA	JDC 12613
C	11-25-68	32062	2-9	3,6	EA	-
D	6-30-67	34038	ALL	1,2,5,7	EA	IMPORTANT
E	8-10-67	34336	1,8	-	EA	-
F	8-31-67	34459	9	-	EA	INTERVAL
						TOOLS AND MATERIAL

- IMPORTANT: 1. In some steps the DSKY operations and displays required when the LGC contains Program Aurora 88 (2021101-021) are different from the DSKY operations and displays required when the LGC contains Program Aurora 85 (2021101-011). These differences are noted within the procedures.
- Insure that connector assembly (2003099) is re-moved and W226-P1 is connected to the LGC test connector before proceeding
  - Perform JDC 12613 to establish a Master Initialization condition. Place system in ISS Standby condition.
  - Set the VOLTAGE SELECT on the Power Control panel to RDC. Set the switches on RDC Interface panel as follows:
    - DE MARGINS to NORM
    - CHAN V METERS to DCMV
    - CHANNEL V selector to 601
  - Perform the following DSKY operations:
    - VERB 57 ENTR
    - 00011 ENTR
    - Observe Row 2 indicates 00377
    - Observe Row 2 indicates 00377

VERIFICATION WITH SIDL REQUIRED BEFORE USE  
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FORM 6-1-64  
Ch. 1-1-64

ENG ON-OFF ASC OR DESC TEST  
10. Set the CHANNEL V selectors to 506 (ENG ON, ASC OR DESC) and 520 (ENG OFF, ASC OR DESC). Record the DCMV indications for each position.

- CHANNEL V
- |    |     |         |
|----|-----|---------|
| a. | 601 | RCS JET |
| b. | 602 | -X4U    |
| c. | 603 | -X3U    |
| d. | 604 | +X3D    |
| e. | 605 | -X2U    |
| f. | 606 | +X2D    |
| g. | 607 | -X1U    |
| h. | 608 | +X1D    |

5. Press the ENTR pushbutton on the DSKY. Observe Row 1 indicates 00006 and Row 2 indicates 00377.

6. Repeat step 4.  
7. Set the CHANNEL V selectors to the positions specified below and record the DCMV indications for each position.

- CHANNEL V
- |    |     |         |
|----|-----|---------|
| a. | 609 | RCS JET |
| b. | 610 | +Z3F    |
| c. | 611 | -Z4F    |
| d. | 612 | -Z1F    |
| e. | 613 | +Z2F    |
| f. | 614 | +Y2S    |
| g. | 615 | -Y3S    |
| h. | 616 | -Y4S    |
|    |     | -Y1S    |

8. Press the ENTR pushbutton on the DSKY. Observe Row 1 indicates 00011 and Row 2 indicates 30000.  
9. Repeat step 7.

17. Make following switch settings and connections:  
a. On XY Interface Panel set

- SCOPE switch to DIFF T.
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2. CHANNEL T to 213 (INC THROTTLE RATE DESCENT ENGINE)  
3. LOAD CHAN T 200 OHMS - press to test

- b. Connect coax jumpers as follows:  
1. From SCOPE A on XY Interface Panel to Oscilloscope Channel A input jack.

2. From SCOPE A on XY Interface Panel to Oscilloscope EXT TRIG input jack.  
3. From SCOPE B on XY Interface Panel to Oscilloscope Channel B input jack.

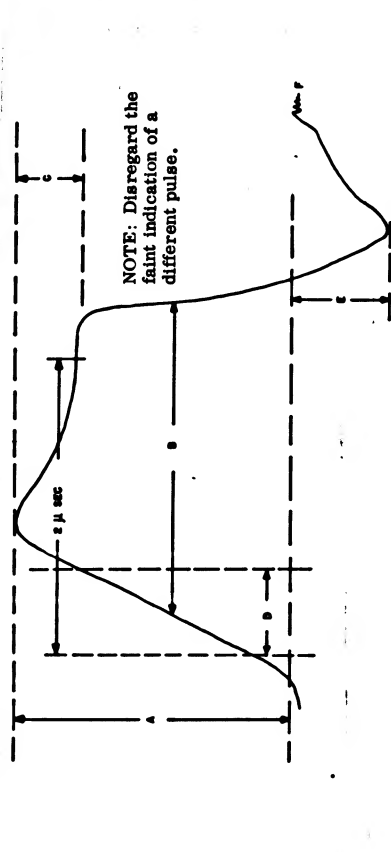
- c. On Oscilloscope set  
1. SOURCE switch to EXT.  
2. MODE switch to A + B.  
3. Scope B switch to INVERT DC.

18. Measure and record the oscilloscope indications of A through F. (See Figure 1.)  
19. Press the ENTR pushbutton on the DSKY. The signal on the oscilloscope shall disappear.

20. Set the CHANNEL T switches to 214 (DEC THROTTLE RATE DESC ENGINE). Measure and record the oscilloscope indications of A through F. (See Figure 1.)

21. Press the ENTR pushbutton on the DSKY. The signal on the oscilloscope shall disappear.  
ALTITUDE "1", ALTITUDE "0" TEST

22. Set the CHANNEL T switches to 317



- A - Amplitude: measured to pulse maximum positive level  
B - Pulse width: measured at A/2 level  
C - Droop: measured from pulse maximum positive level to level at 2 microseconds  
D - Rise Time: time required for pulse to rise from 10% to 90% of A  
E - Backsawing: measured to signal maximum negative level  
F - Noise: (No Pulse)

Figure 1. Waveform Description

28. Set the FREQ + PHASE switch on the XY Interface Panel to FR T-8. Connect a coax jumper to CNTR-A and FREQ AC on the Frequency Counter Panel. Connect a coax jumper to CNTR-B and STOP-B.

29. Set the Frequency Counter Panel controls as follows:  
a. INPUT VOLTS RMS selector to 6.4  
b. TRIGGER LEVEL control to mid range  
c. TIME selector to MS

JOB	LOC OUTPUT TEST	JDC 12621 REV F PAGE 5 OF 10
SUBSYSTEM	LEM G & N SYSTEM	ASSY
30. Make the following switch settings on the AGC INPUT COUNTERS portion of the XY Interface Panel:		
a. Selector to 12		
b. STANDARD RATE pushbutton - press to light		
c. POSITIVE pushbutton - press to light		
d. OUT IN pushbutton - press to light		
e. Set C33-4, C33-5, C33-8 on RDC Panel.		
31. Press VERB 57 ENTR, 00014 ENTR VERB 33 ENTR. Record the counter indication.		
NOTE: If in the above step the counter did not count or did not indicate about 80 milliseconds, press RESET and adjust the INPUT VOLTS RMS and TRIGGER LEVEL controls concurrently until a repeatable or satisfactory indication is present.		
LR RANGE GATE STROBE TEST		
32. Set SCOPE switch on XY Interface Panel to DIFF T. Measure and record oscilloscope indications A through F. (See Figure 1.) After completing measurements, set SCOPE switch to ALTERNATE S→T, and oscilloscope MODE switch to ALT. Set oscilloscope B switch to NORMAL DC.		
LR RANGE GATE STROBE TIMING TEST		
33. Set the CHANNEL S switches to 118 (LR RESET STROBE).		

JOB	LOC OUTPUT TEST	JDC 12621 REV F PAGE 6 OF 10
SUBSYSTEM	LEM G & N SYSTEM	ASSY
LR V <sub>Z</sub> GATE STROBE TIMING TEST		
39. Set the CHANNEL S switches to 118. Set oscilloscope MODE switch to ALT. Set oscilloscope B switch to NORM DC. Set SCOPE switch on XY Interface Panel to ALTERNATE S→T.		
40. Determine and record the timing lag of a LR V <sub>Z</sub> Gate Strobe pulse (T-219) to a LR Reset Strobe pulse (S-118) at their respective A/2 points.		
LR V <sub>Z</sub> GATE STROBE TEST		
41. Set SCOPE switch on XY Interface Panel to DIFF T. Set oscilloscope MODE switch to A + B. Set oscilloscope B switch to INVERT DC. Measure and record oscilloscope indications of A through F of Figure 1.		
LR V <sub>Z</sub> DATA ACQUISITION TEST		
NOTE: DSKY display shown in parenthesis in step 42 is applicable to Program Aurora 88 only.		
42. Perform the following DSKY operations:		
a. VERB 14 NOUN 01 ENTR		
b. Address of V <sub>Z</sub> data 03437		
c. Observe Row 1 indicates 00001		
d. Observe Row 2 indicates 10437 (07777)		
LR V <sub>Z</sub> READ CYCLE TIMING TEST		
43. Reset Frequency Counter. Set XY Interface Panel switches as follows:		

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JOB	LOC OUTPUT TEST	JDC 12621 REV F PAGE 7 OF 10
SUBSYSTEM	LEM G & N SYSTEM	ASSY
c. Observe Row 1 indicates 00001		
d. Observe Row 2 indicates 10437 (07777)		
LR V <sub>X</sub> READ CYCLE TIMING TEST		
49. Reset Frequency Counter. Set XY Interface Panel switches as follows:		
CHANNEL T to 217 (LR V <sub>X</sub> GATE STROBE), CHANNEL S to 314, and FREQ + PHASE to FR T		
T→S.		
50. Enter VERB 33 and press the ENTR pushbutton on the DSKY. Record the Frequency Counter indication. Set FREQ + PHASE switch on XY Interface panel to OFF.		
LR V <sub>X</sub> GATE STROBE TIMING TEST		
51. Set the CHANNEL S switches to 118. Set oscilloscope MODE switch to ALT. Set oscilloscope B switch to NORM DC. Set SCOPE switch on XY Interface Panel to ALTERNATE S→T.		
52. Determine and record the timing lag of a LR V <sub>X</sub> Gate Strobe pulse (T-217) to a LR Reset Strobe pulse (S-118) at their respective A/2 points.		
LR V <sub>X</sub> GATE STROBE TEST		
53. Repeat step 41.		
LR V <sub>X</sub> DATA ACQUISITION TEST		
NOTE: DSKY display shown in parenthesis in step 54 is applicable to Program Aurora 88 only.		
54. Perform the following DSKY operations:		
a. VERB 14 NOUN 01 ENTR		

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JOB	LOC OUTPUT TEST	JDC 12621 REV F PAGE 8 OF 10
SUBSYSTEM	LEM G & N SYSTEM	ASSY
RR RANGE RATE DATA ACQUISITION TEST		
60. Perform the following DSKY operations:		
a. VERB 14 NOUN 01 ENTR		
b. Address of RR Range data 03437		
c. Observe Row 1 indicates 77777		
d. Observe Row 2 indicates 36627		
RR RANGE READ CYCLE TIMING TEST		
61. Reset Frequency Counter. Set XY Interface Panel switches as follows:		
CHANNEL T to 215 (RR RANGE GATE STROBE), CHANNEL S to 313 (RR SYNC FOR READOUT), and FREQ + PHASE switch to FR T		
T→S.		
62. Enter VERB 33 and press the ENTR pushbutton on the DSKY. Record the Frequency Counter indication. Set FREQ + PHASE switch on XY Interface panel to OFF.		
RR SYNC FOR READOUT STROBE TEST		
63. Repeat step 41. Measure and record the oscilloscope indications of A through F of Figure 1.		
RR RANGE GATE STROBE TIMING TEST		
64. Set oscilloscope MODE switch to ALT. Set oscilloscope B switch to NORM DC. Set SCOPE switch on XY Interface Panel to ALTERNATE S→T and set the CHANNEL S switches to 105.		

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k. 55000 ENTR ENTR  
l. 25757 ENTR ENTR  
m. 01750 ENTR  
n. NOUN 01 ENTR  
o. 00411 ENTR  
p. 01000 ENTR  
q. VERB 25 NOUN 26 ENTR  
r. 04000 ENTR  
s. 01750 ENTR  
t. 00003 ENTR  
u. VERB 30 ENTR  
v. VERB 01 NOUN 01 ENTR  
w. 01000 ENTR  
x. Observe  
Row 1 indicates 77777  
y. NOUN 01 ENTR  
z. 01077 ENTR  
aa. Observe  
Row 1 indicates 77777  
If Row 1 does not indicate 77777, repeat step 69.  
70. Make the following switch settings on the XY Interface Panel:  
a. DL ENABLE pushbutton - press to light  
b. WORD RATE 50 PPS pushbutton - press to light  
c. Press 200 OHM LOAD pushbuttons for CHANNEL 8 and CHANNEL T.  
Set oscilloscope MODE switch to A+B. Set oscilloscope B switch to INVERT DC.  
d. SCOPE switch to DIFF T.

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76. Deactivate all switches on the XY Interface Panel. On the RDC Interface Panel, set CHAN V METERS switch to OFF and all other switches fully CCW. On the XY Interface Panel, press the DL ENABLE and WORD RATE 50 PPS pushbuttons. The pushbuttons shall light.  
77. Perform the following DSKY operations:  
a. VERB 36 ENTR

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ASSEMBLY UNDER TEST				TEST HISTORY			
TITLE	DATE	START	END	SITE / LOCATION	TIME	START	END
SER. NO.	DWG	REV			TOTAL ELAPSED		
MAJOR GROUND SUPPORT EQUIPMENT							
CONDUCTED BY				APPROVED BY			
NAME / AFFILIATION				NAME / AFFILIATION			
JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ ACC	
4.a	RCS Jet -X4U	vdc	2.0		5.0		
4.b	RCS Jet +X4D	vdc	2.0		5.0		
4.c	RCS Jet -X3U	vdc	2.0		5.0		
4.d	RCS Jet +X3D	vdc	2.0		5.0		
4.e	RCS Jet -X2U	vdc	2.0		5.0		
4.f	RCS Jet +X2D	vdc	2.0		5.0		
4.g	RCS Jet -X1U	vdc	2.0		5.0		
4.h	RCS Jet +X1D	vdc	2.0		5.0		
6	RCS Jet -X4U	vdc	9.0		11.0		
	RCS Jet +X4D	vdc	9.0		11.0		
	RCS Jet -X3U	vdc	9.0		11.0		
	RCS Jet +X3D	vdc	9.0		11.0		
	RCS Jet -X2U	vdc	9.0		11.0		
	RCS Jet +X2D	vdc	9.0		11.0		
	RCS Jet -X1U	vdc	9.0		11.0		
	RCS Jet +X1D	vdc	9.0		11.0		
7.a	RCS Jet +Z3F	vdc	2.0		5.0		
7.b	RCS Jet -Z4F	vdc	2.0		5.0		

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FORM 100-6  
CHG 7-23-55

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ ACC
7.c	RCS Jet -Z1F	vdc	2.0		5.0	
7.d	RCS Jet +Z2F	vdc	2.0		5.0	
7.e	RCS Jet +Y2S	vdc	2.0		5.0	
7.f	RCS Jet -Y3S	vdc	2.0		5.0	
7.g	RCS Jet -Y4S	vdc	2.0		5.0	
7.h	RCS Jet -Y1S	vdc	2.0		5.0	
9.a	RCS Jet +Z3F	vdc	9.0		11.0	
9.b	RCS Jet -Z1F	vdc	9.0		11.0	
9.c	RCS Jet -Z1F	vdc	9.0		11.0	
9.d	RCS Jet +Z3F	vdc	9.0		11.0	
9.e	RCS Jet +Y2a	vdc	9.0		11.0	
9.f	RCS Jet -Y3S	vdc	9.0		11.0	
9.g	RCS Jet -Y4S	vdc	9.0		11.0	
9.h	RCS Jet -Y1s	vdc	9.0		11.0	
10	Eng On	vdc	2.0		5.0	
	Eng Off	vdc	2.0		5.0	
12	Eng On	vdc	9.0		11.0	
	Eng Off	vdc	9.0		11.0	
13.a	+Pitch Gimbal Trim	vdc	2.0		5.0	
13.b	-Pitch Gimbal Trim	vdc	2.0		5.0	
13.c	+Roll Gimbal Trim	vdc	2.0		5.0	
13.d	-Roll Gimbal Trim	vdc	2.0		5.0	
16	+Pitch Gimbal Trim	vdc	9.0		11.0	
	-Pitch Gimbal Trim	vdc	9.0		11.0	
	+Roll Gimbal Trim	vdc	9.0		11.0	
	-Roll Gimbal Trim	vdc	9.0		11.0	
18a	Amplitude	volts	4.0		10.0	

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EQUIPMENT TEST  
DATA SHEET 3 OF 7

JDC  
NO. 12621  
REV. F

JOB LGC OUTPUT TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ ACC
18B	Pulse Width	u sec	2.0		4.0	
18C	Droop	volts			A/5	
18D	Rise Time	u sec			0.20	
18E	Backsawing	volts			4.0	
18F	Noise	P-PV	0		0.4	
20A	Amplitude	volts	4.0		10.0	
20B	Pulse Width	u sec	2.0		4.0	
20C	Droop	volts			A/5	
20D	Rise Time	u sec			0.20	
20E	Backsawing	volts			4.0	
20F	Noise	P-PV	0		0.4	
22.a.A	Amplitude	volts	4.0		10.0	
22.a.B	Pulse Width	u sec	2.0		4.0	
22.a.C	Droop	volts			A/5	
22.a.D	Rise Time	u sec			0.2	
22.a.E	Backsawing	volts			4.0	
22.b.A	Amplitude	volts	4.0		10.0	
22.b.B	Pulse Width	u sec	2.0		4.0	
22.b.C	Droop	volts			A/5	
22.b.D	Rise Time	u sec			0.2	
22.b.E	Backsawing	volts			4.0	
24.a.A	Amplitude	volts	4.0		10.0	
24.a.B	Pulse Width	u sec	2.0		4.0	
24.a.C	Droop	volts			A/5	
24.a.D	Rise Time	u sec			.2	
24.a.E	Backsawing	volts			4.0	
24.b.A	Amplitude	volts	4.0		10.0	
24.b.B	Pulse Width	u sec	2.0		4.0	

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JDC  
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JOB LGC OUTPUT TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ ACC
24.b.C	Droop	volts			A/5	
24.b.D	Rise Time	u sec			.2	
24.b.E	Backsawing	volts			4.0	
26.a.A	Amplitude	volts	4.0		10.0	
26.a.B	Pulse Width	u sec	2.0		4.0	
26.a.C	Droop	volts			A/5	
26.a.D	Rise Time	u sec			.2	
26.a.E	Backsawing	volts			4.0	
26.a.F	Noise	volts	0		.4	
26.b.A	Amplitude	volts	4.0		10.0	
26.b.B	Pulse Width	u sec	2.0		4.0	
26.b.C	Droop	volts			A/5	
26.b.D	Rise Time	u sec			.2	
26.b.E	Backsawing	volts			4.0	
26.b.F	Noise	volts	0		.4	
31.	LR Range Read Cycle Timing	m sec	80.315			
32.A	Amplitude	volts	4.0		10.0	
32.B	Pulse Width	u sec	2.0		4.0	
32.C	Droop	volts			A/5	
32.D	Rise Time	u sec			0.20	
32.E	Backsawing	volts			4.0	
32.F	Noise	volts	0		0.4	
34	LR Range Gate Strobe Timing	u sec	1.75		2.25	
35.A	Amplitude	volts	4.0		10.0	
35.B	Pulse Width	u sec	2.0		4.0	

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JDC  
NO. 12621  
REV. F

JOB LGC OUTPUT TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ ACC
35.C	Droop	volts			A/5	
35.D	Rise Time	u sec			0.20	
35.E	Backsawing	volts			4.0	
35.F	Noise	volts	0		0.4	
38	LR V Z Read Cycle Timing	m sec	80.315			
40	LR V Z Gate Strobe Timing	u sec	1.75		2.25	
41.A	Amplitude	volts	4.0		10.0	
41.B	Pulse Width	u sec	2.0		4.0	
41.C	Droop	volts			A/5	
41.D	Rise Time	u sec			0.20	
41.E	Backsawing	volts			4.0	
41.F	Noise	volts	0		0.4	
44	LR V Y Read Cycle Timing	m sec	80.315			
46	LR V Y Gate Strobe Timing	u sec	1.75		2.25	
47.A	Amplitude	volts	4.0		10.0	
47.B	Pulse Width	u sec	2.0		4.0	
47.C	Droop	volts			A/5	
47.D	Rise Time	u sec			.20	
47.E	Backsawing	volts			4.0	
47.F	Noise	volts	0		0.4	
50	LR V X Read Cycle Timing	m sec	80.315			
52	LR V X Gate Strobe Timing	u sec	1.75		2.25	

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JDC  
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JOB LGC OUTPUT TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ ACC
53.A	Amplitude	volts	4.0		10.0	
53.B	Pulse Width	u sec	2.0		4.0	
53.C	Droop	volts			A/5	
53.D	Rise Time	u sec			0.2	
53.E	Backsawing	volts			4.0	
53.F	Noise	P-PV	0		0.4	
56	RR Range Rate Read Cycle Timing	m sec	80.935			
58	RR Range Rate Gate Strobe Timing	u sec	1.75		2.25	
59.A	Amplitude	volts	4.0		10.0	
59.B	Pulse Width	u sec	2.0		4.0	
59.C	Droop	volts			A/5	
59.D	Rise Time	u sec			0.2	
59.E	Backsawing	volts			4.0	
59.F	Noise	P-PV	0		0.4	
62	RR Range Read Cycle Timing	m sec	80.935			
63.A	Amplitude	volts	4.0		10.0	
63.B	Pulse Width	u sec	2.0		4.0	
63.C	Droop	volts			A/5	
63.D	Rise Time	u sec			0.2	
63.E	Backsawing	volts			4.0	
63.F	Noise	P-PV	0		0.4	
65	RR Range Gate Strobe Timing	u sec	1.75		2.25	
66.A	Amplitude	volts	4.0		10.0	
66.B	Pulse Width	u sec	2.0		4.0	
66.C	Droop	volts			A/5	

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JOB LGC OUTPUT TEST

JDC  
NO. 12621  
REV. F

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ ACC
66.D	Rise Time	u sec			.20	
66.E	Backsawing	volts			4.0	
66.F	Noise	PP-V	0		0.4	
71.A	Amplitude	volts	4.0		10.0	
71.B	Pulse Width	u sec	2.0		4.0	
71.C	Droop	volts			A/5	
71.D	Rise Time	u sec			0.2	
71.E	Backsawing	volts			4.0	
72	DLNK Data	u sec			1 u sec	
	Sync Delay Time					
73.A	Amplitude	volts	5.0		9.0	
73.B	Pulse Width	u sec	2.0		6.0	
73.C	Droop	volts			A/5	
73.D	Rise Time	u sec			0.2	
73.E	Backsawing	volts			4.0	

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Aug. 7-23-55

Rev.	Date	TORR NO.	PAGES REVISED	APPROVAL	REFERENCES
1	8-10-66	30531	All	MIT	PG 6016000, JDC 12613
2	10-6-66	31443	2-9	EA	-
3	11-25-66	32082	2-9	EA	IMPORTANT
4	6-30-67	34038	All	EA	-
5	8-10-67	34336	1, 8	EA	-
6	8-31-67	34459	9	EA	INTERVAL
7	2-6-68	35502	1	EA	TOOLS AND MATERIAL

**IMPORTANT: 1.** In some steps the DSKY operations and displays required when the LOC contains Program Aurora 88 (2021101-021) are different from the DSKY operations and displays required when the LOC contains Program Aurora 85 (2021101-011). These differences are noted within the procedures.

**2.** Insure that connector assembly (2003099) is removed and W228-P1 is connected to the LOC test connector before proceeding

**VERIFICATION WITH SIDL REQUIRED BEFORE USE**

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**ENG ON-OFF ASC OR DESC TEST**

10. Set the CHANNEL V selectors to 506 (ENG ON, ASC OR DESC) and 520 (ENG OFF, ASC OR DESC). Record the DCVM indications for each position.

11. Press the ENTR pushbutton on the DSKY. Observe Row 1 indicates 00013 and Row 2 indicates 37400.

12. Set the CHANNEL V selectors to 506 and 520. Record the DCVM indications for each position.

**PITCH-ROLL GIMBAL TRIM TESTS**

13. Set the CHANNEL V selectors to the positions specified below and record the DCVM indications for each position.

CHANNEL V	GIMBAL TRIM
a. 406	+Pitch
b. 501	-Pitch
c. 504	+Roll
d. 617	-Roll

14. Observe that the RR AUTO ANGLE ENABLE and LR HOVER POS COM lamps on the Monitor Panel are lighted.

15. Press the ENTR pushbutton on the DSKY.

16. Repeat step 13. Observe that the lamps specified in step 14 are not lighted. Set the CHANNEL V selectors to 101.

**INC AND DEC THROTTLE RATE DESC ENG TEST**

17. Make following switch settings and connections:

a. On XY Interface Panel set 1. SCOPE switch to DIFF T.

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**2. CHANNEL T to 213 (INC THROTTLE RATE DESCENT ENGINE)**

**3. LOAD CHAN T 200 OHMS - press to test**

b. Connect coax jumpers as follows:

1. From SCOPE A on XY Interface Panel to Oscilloscope Channel A input jack.

2. From SCOPE A on XY Interface Panel to Oscilloscope EXT TRIG input jack.

3. From SCOPE B on XY Interface Panel to Oscilloscope Channel B input jack.

c. On Oscilloscope set

1. SOURCE switch to EXT.

2. MODE switch to A + B.

3. Scope B switch to INVERT DC.

18. Measure and record the oscilloscope indications of A through F. (See Figure 1.)

19. Press the ENTR pushbutton on the DSKY. The signal on the oscilloscope shall disappear.

20. Set the CHANNEL T switches to 214 (DEC THROTTLE RATE DESC ENGINE). Measure and record the oscilloscope indications of A through F. (See Figure 1.)

21. Press the ENTR pushbutton on the DSKY. The signal on the oscilloscope shall disappear.

**ALTITUDE "1", ALTITUDE "0" TEST**

22. Set the CHANNEL T switches to 317 (ALTITUDE "1") and 318 (ALTITUDE "0"). Measure and record the oscilloscope indications of A through E for each position. (See Figure 1.)

23. Press the ENTR pushbutton on the DSKY. Set the CHANNEL T switches to 317 and 318 and observe that the signals on the oscilloscope have disappeared for each position.

24. Set CHANNEL T switches to 319 (ALTITUDE RATE "1") and 320 (ALTITUDE RATE "0"). Measure and record the oscilloscope indications of A through E for each position. (See Figure 1.)

25. Press the ENTR pushbutton on the DSKY. Set the CHANNEL T switches to 319 and 320 and observe that the signal on the oscilloscope disappears for each position.

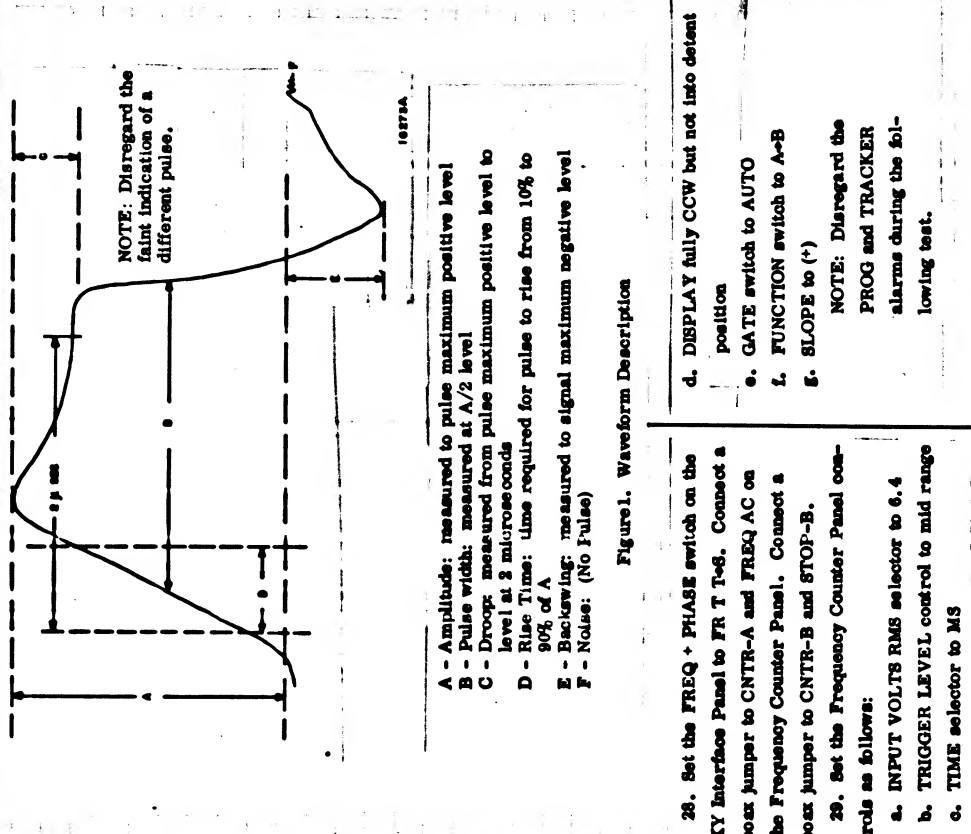
**RR AND LR RESET STROBE TEST**

26. Press the LOAD CHAN 5 200 OHMS pushbutton on the XY Interface Panel to ON. Set the SCOPE switch to DIFF S.

Set the CHANNEL S switches to 105 (RR RESET STROBE) and 118 (LR RESET STROBE) and measure and record the oscilloscope indications of A through F for each position. (See Figure 1.)

**LR RANGE READ CYCLE TIMING TEST**

27. Set the CHANNEL T switches to 220 (LR RANGE GATE STROBE) and CHANNEL S switches to 314 (LR SYNC FOR READ-OUTS).



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<p>30. Make the following switch settings on the AOC INPUT COUNTERS portion of the XY Interface Panel:</p> <p>a. Selector to 13</p> <p>b. STANDARD RATE pushbutton - press to light</p> <p>c. POSITIVE pushbutton - press to light</p> <p>d. OUT IN pushbutton - press to light</p> <p>e. Set C33-4, C33-5, C33-8 on RDC Panel.</p> <p>31. Press VERB 57 ENTR, 00014 ENTR VERB 33 ENTR. Record the counter indication.</p> <p>NOTE: If in the above step the counter did not count or did not indicate about 80 milliseconds, press RESET and adjust the INPUT VOLTS RMS and TRIGGER LEVEL controls concurrently until a repeatable or satisfactory indication is present.</p> <p>LR RANGE GATE STROBE TEST</p> <p>32. Set SCOPE switch on XY Interface Panel to DIFF T. Measure and record oscilloscope indications A through F. (See Figure 1.) After completing measurements, set SCOPE switch to ALTERNATE S-T, and oscilloscope MODE switch to ALT. Set oscilloscope MODE switch to ALT. Set oscilloscope B switch to NORMAL DC.</p> <p>LR RANGE GATE STROBE TIMING TEST</p> <p>33. Set the CHANNEL S switches to 118 (LR RESET STROBE).</p>		
<p>34. Determine the timing lag of a LR Range Gate Strobe pulse (T-220) to a LR Reset Strobe pulse (S-118) at their respective A/2 points.</p> <p>LR SYNC FOR READOUT STROBE TEST</p> <p>35. Set the CHANNEL S switches to 314 (LR SYNC FOR READOUT). Set SCOPE switch on XY Interface Panel to DIFF S. Set oscilloscope MODE switch to A + B. Set oscilloscope B switch to INVERT DC. On XY Interface panel set FREQ + PHASE switch to OFF. Measure and record the oscilloscope indications of A through F. (See Figure 1.)</p> <p>LR RANGE DATA ACQUISITION TEST</p> <p>36. Perform the following DSKY operations:</p> <p>a. VERB 14 NOUN 01 ENTR</p> <p>b. Address of LR Range data 03437</p> <p>c. Observe Row 1 indicates 00011</p> <p>d. Observe Row 2 indicates 37653</p> <p>READ CYCLE TIMING TEST LR V<sub>Z</sub></p> <p>37. Reset Frequency Counter. Set XY Interface Panel switches as follows:</p> <p>CHANNEL T to 219 (LR V<sub>Z</sub> GATE STROBE) and FREQ + PHASE to FR T T → S.</p> <p>38. Enter VERB 33 and press the ENTR pushbutton on the DSKY. Record the Frequency Counter indications. Set FREQ + PHASE switch on XY Interface panel to OFF.</p>		

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<p>CHANEL T to 218 (LR V<sub>Z</sub> GATE STROBE), CHANNEL S to 314, and FREQ + PHASE to FR T T → S.</p> <p>44. Enter VERB 33 and press the ENTR pushbutton on the DSKY. Record the Frequency Counter indication. Set the FREQ + PHASE switch on the XY Interface panel to OFF.</p> <p>LR V<sub>Z</sub> GATE STROBE TIMING TEST</p> <p>45. Set the CHANNEL S switches to 118. Set oscilloscope MODE switch to ALT. Set oscilloscope B switch to NORM DC. Set SCOPE switch on XY Interface Panel to ALTERNATE S → T.</p> <p>46. Determine and record the timing lag of a LR V<sub>Z</sub> Gate Strobe pulse (T-218) to a LR Reset Strobe pulse (S-118) at their respective A/2 points.</p> <p>LR V<sub>Z</sub> STROBE TEST</p> <p>47. Repeat step 41.</p> <p>LR V<sub>Z</sub> DATA ACQUISITION TEST</p> <p>NOTE: DSKY display shown in parenthesis in step 48 is applicable to Program Aurora 88 only.</p> <p>48. Perform the following DSKY operations:</p> <p>a. VERB 14 NOUN 01 ENTR</p> <p>b. Address of V<sub>Z</sub> data 03437</p>		
<p>49. Reset Frequency Counter. Set XY Interface Panel switches as follows:</p> <p>CHANNEL T to 219 (LR V<sub>Z</sub> GATE STROBE) and FREQ + PHASE to FR T T → S.</p> <p>50. Enter VERB 33 and press the ENTR pushbutton on the DSKY. Record the Frequency Counter indications. Set FREQ + PHASE switch on XY Interface panel to OFF.</p>		

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<p>c. Observe Row 1 indicates 00001</p> <p>d. Observe Row 2 indicates 10437 (07777)</p> <p>LR V<sub>X</sub> READ CYCLE TIMING TEST</p> <p>49. Reset Frequency Counter. Set XY Interface Panel switches as follows:</p> <p>CHANNEL T to 217 (LR V<sub>X</sub> GATE STROBE), CHANNEL S to 314, and FREQ + PHASE to FR T T → S.</p> <p>50. Enter VERB 33 and press the ENTR pushbutton on the DSKY. Record the Frequency Counter indication. Set FREQ + PHASE switch on XY Interface panel to OFF.</p> <p>LR V<sub>X</sub> GATE STROBE TIMING TEST</p> <p>51. Set the CHANNEL S switches to 118. Set oscilloscope MODE switch to ALT. Set oscilloscope B switch to NORM DC. Set SCOPE switch on XY Interface Panel to ALTERNATE S → T.</p> <p>52. Determine and record the timing lag of a LR V<sub>X</sub> Gate Strobe pulse (T-217) to a LR Reset Strobe pulse (S-118) at their respective A/2 points.</p> <p>LR V<sub>X</sub> GATE STROBE TEST</p> <p>53. Repeat step 41.</p> <p>LR V<sub>X</sub> DATA ACQUISITION TEST</p> <p>NOTE: DSKY display shown in parenthesis in step 54 is applicable to Program Aurora 88 only.</p> <p>54. Perform the following DSKY operations:</p> <p>a. VERB 14 NOUN 01 ENTR</p>		
<p>b. Address of V<sub>X</sub> data 03437</p> <p>c. Observe Row 1 indicates 00001</p> <p>d. Observe Row 2 indicates 10437 (07777)</p> <p>RR RANGE RATE READ CYCLE TIMING TEST</p> <p>55. Reset Frequency Counter. Set XY Interface Panel switches as follows:</p> <p>CHANNEL T to 216 (RR RANGE RATE STROBE), CHANNEL S to 313, and FREQ + PHASE to FR T T → S.</p> <p>56. Enter VERB 33 and press the ENTR pushbutton on the DSKY. Record the Frequency Counter indications. Set FREQ + PHASE switch on XY Interface panel to OFF.</p> <p>RR RANGE RATE GATE STROBE TIMING TEST</p> <p>57. Set the CHANNEL S switches to 106. Set oscilloscope MODE switch to ALT. Set oscilloscope B switch to NORM DC. Set SCOPE switch on XY Interface Panel to ALTERNATE S → T.</p> <p>58. Determine and record the timing lag of a RR Range Rate Gate Strobe pulse (T-216) to a RR Reset Strobe pulse (S-106) at their respective A/2 points.</p> <p>RR RANGE RATE GATE STROBE TEST</p> <p>59. Repeat step 41.</p>		

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<p>RR RANGE RATE DATA ACQUISITION TEST</p> <p>60. Perform the following DSKY operations:</p> <p>a. VERB 14 NOUN 01 ENTR</p> <p>b. Address of RR Range data 03437</p> <p>c. Observe Row 1 indicates 77777</p> <p>d. Observe Row 2 indicates 36937</p> <p>RR RANGE READ CYCLE TIMING TEST</p> <p>61. Reset Frequency Counter. Set XY Interface Panel switches as follows:</p> <p>CHANNEL T to 215 (RR RANGE GATE STROBE), CHANNEL S to 313 (RR SYNC FOR READOUT), and FREQ + PHASE switch to FR T T → S.</p> <p>62. Enter VERB 33 and press the ENTR pushbutton on the DSKY. Record the Frequency Counter indication. Set FREQ + PHASE switch on XY Interface panel to OFF.</p> <p>RR SYNC FOR READOUT STROBE TEST</p> <p>63. Repeat step 41. Measure and record the oscilloscope indications of A through F of Figure 1.</p> <p>RR RANGE GATE STROBE TIMING TEST</p> <p>64. Set oscilloscope MODE switch to ALT. Set oscilloscope B switch to NORM DC. Set SCOPE switch on XY Interface Panel to ALTERNATE S → T and set the CHANNEL S switches to 105.</p>		
<p>65. Determine and record the timing lag of a RR Range Gate Strobe pulse (T-215) to a RR Reset Strobe pulse (S-105) at their respective A/2 points.</p> <p>RR RANGE GATE STROBE TEST</p> <p>66. Repeat step 41.</p> <p>RR RANGE DATA ACQUISITION TEST</p> <p>67. Perform the following DSKY operations:</p> <p>a. VERB 14 NOUN 01 ENTR</p> <p>b. Address of RR Range data 03437</p> <p>c. Observe Row 1 indicates 00017</p> <p>d. Observe Row 2 indicates 37770</p> <p>68. Deactivate all switches on the XY Interface Panel. Enter VERB 36 and press the ENTR pushbutton on the DSKY.</p> <p>DOWN LINK TELEMETRY TEST</p> <p>69. Perform the following DSKY operations:</p> <p>a. VERB 21 NOUN 01 ENTR</p> <p>b. 01760</p> <p>c. 11763</p> <p>d. NOUN 15</p> <p>e. 01765</p> <p>f. 04353</p> <p>g. 00100</p> <p>h. 77777</p> <p>i. 55753</p> <p>j. 31754</p>		

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ASSY

71. Set the CHANNEL T switches to 102 (DLNK DATA). Measure and record the oscilloscope indications of A through E. (See Figure 1.)
72. Set the CHANNEL S switches to 307 (DLNK SYNC). Set oscilloscope MODE switch to ALT. Measure and record the delay of the DLNK DATA pulse with respect to the DLNK SYNC pulse.
73. Press the WORD RATE 10 PPS pushbutton, the pushbutton shall light. Press the WORD RATE 50 PPS pushbutton, the pushbutton shall go out. Set oscilloscope MODE switch to A + B. Set B switch to INVERT DC. Set SCOPE switch on XY Interface Panel to DIFF T. Repeat step 71.
74. Press the WORD RATE 300 PPS pushbutton, the pushbutton shall light. Press the WORD RATE 10 PPS pushbutton, the pushbutton shall go out.
- NOTE: The PROG alarm on the DSKY shall light.
75. Perform the following DSKY operations:
- a. VERB 01 NOUN 10 ENTR
- b. 00033 ENTR
- c. Observe
- Row 1 indicates XXXXX
76. Deactivate all switches on the XY Interface Panel. On the RDC Interface Panel, set CHAN V METERS switch to OFF and all other switches fully CCW. On the XY Interface Panel, press the DL ENABLE and WORD RATE 50 PPS pushbuttons. The pushbuttons shall light.
77. Perform the following DSKY operations:
- a. VERB 36 ENTR

Row 1 indicates 77777

If Row 1 does not indicate 77777, repeat step 69.

70. Make the following switch settings on the XY Interface Panel:

- a. DL ENABLE pushbutton - press to light
- b. WORD RATE 50 PPS pushbutton - press to light
- c. Press 200 OHM LOAD pushbuttons for CHANNEL S and CHANNEL T. Set oscilloscope MODE switch to A + B. Set oscilloscope B switch to INVERT DC.
- d. SCOPE switch to DIFF T.

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EQUIPMENT TEST  
DATA SHEET 1 OF 7

JOB LGC OUTPUT TEST

JDC  
NO. 12621  
REV. G  
INITIAL TDRR 27134

ASSEMBLY UNDER TEST			TEST HISTORY		
TITLE		DATE	START	END	SITE / LOCATION
SER. NO.	DWG.	REV.	TIME	START	END
MAJOR GROUND SUPPORT EQUIPMENT					
CONDUCTED BY: NAME/AFFILIATION: APPROVED BY: NAME/AFFILIATION:					
JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE REJ ACC
4.a	RCS Jet -X4U	vdc	2.0		5.0
4.b	RCS Jet +X4D	vdc	2.0		5.0
4.c	RCS Jet -X3U	vdc	2.0		5.0
4.d	RCS Jet +X3D	vdc	2.0		5.0
4.e	RCS Jet -X2U	vdc	2.0		5.0
4.f	RCS Jet +X2D	vdc	2.0		5.0
4.g	RCS Jet -X1U	vdc	2.0		5.0
4.h	RCS Jet +X1D	vdc	2.0		5.0
6	RCS Jet -X4U	vdc	9.0		11.0
	RCS Jet +X4D	vdc	9.0		11.0
	RCS Jet -X3U	vdc	9.0		11.0
	RCS Jet +X3D	vdc	9.0		11.0
	RCS Jet -X2U	vdc	9.0		11.0
	RCS Jet +X2D	vdc	9.0		11.0
	RCS Jet -X1U	vdc	9.0		11.0
	RCS Jet +X1D	vdc	9.0		11.0
7.a	RCS Jet +Z3F	vdc	2.0		5.0
7.b	RCS Jet -Z4F	vdc	2.0		5.0

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Chg. 7-2-59

SUBSYSTEM LEM G & N SYSTEM

ASSY

76. Deactivate all switches on the XY Interface Panel. On the RDC Interface Panel, set CHAN V METERS switch to OFF and all other switches fully CCW. On the XY Interface Panel, press the DL ENABLE and WORD RATE 50 PPS pushbuttons. The pushbuttons shall light.
77. Perform the following DSKY operations:
- a. VERB 36 ENTR

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EQUIPMENT TEST  
DATA SHEET 2 OF 7

JOB LGC OUTPUT TEST

JDC  
NO. 12621  
REV. G

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ ACC
7.c	RCS Jet -Z1F	vdc	2.0		5.0	
7.d	RCS Jet +Z2F	vdc	2.0		5.0	
7.e	RCS Jet +Y3S	vdc	2.0		5.0	
7.f	RCS Jet -Y3S	vdc	2.0		5.0	
7.g	RCS Jet -Y4S	vdc	2.0		5.0	
7.h	RCS Jet -Y1S	vdc	2.0		5.0	
9.a	RCS Jet +Z3F	vdc	9.0		11.0	
9.b	RCS Jet -Z4F	vdc	9.0		11.0	
9.c	RCS Jet -Z1F	vdc	9.0		11.0	
9.d	RCS Jet +Z2F	vdc	9.0		11.0	
9.e	RCS Jet +Y2S	vdc	9.0		11.0	
9.f	RCS Jet -Y3S	vdc	9.0		11.0	
9.g	RCS Jet -Y4S	vdc	9.0		11.0	
9.h	RCS Jet -Y1S	vdc	9.0		11.0	
10	Eng On	vdc	2.0		5.0	
	Eng Off	vdc	2.0		5.0	
12	Eng On	vdc	9.0		11.0	
	Eng Off	vdc	9.0		11.0	
13.a	+Pitch Gimbal Trim	vdc	2.0		5.0	
13.b	-Pitch Gimbal Trim	vdc	2.0		5.0	
13.c	+Roll Gimbal Trim	vdc	2.0		5.0	
13.d	-Roll Gimbal Trim	vdc	2.0		5.0	
16	+Pitch Gimbal Trim	vdc	9.0		11.0	
	-Pitch Gimbal Trim	vdc	9.0		11.0	
	+Roll Gimbal Trim	vdc	9.0		11.0	
	-Roll Gimbal Trim	vdc	9.0		11.0	
18a	Amplitude	volts	4.0		10.0	

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FORM 0-140  
Chg. 7-2-59

APOLLO G&N  
EQUIPMENT TEST  
DATA SHEET 3 OF 7

JDC  
NO. 12621  
REV. G

JOB LGC OUTPUT TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ ACC
18B	Pulse Width	u sec	2.0		4.0	
18C	Droop	volts			A/5	
18D	Rise Time	u sec			0.20	
18E	Backsawing	volts			4.0	
18F	Noise	P-PV	0		0.4	
20A	Amplitude	volts	4.0		10.0	
20B	Pulse Width	u sec	2.0		4.0	
20C	Droop	volts			A/5	
20D	Rise Time	u sec			0.20	
20E	Backsawing	volts			4.0	
20F	Noise	P-PV	0		0.4	
22.a.A	Amplitude	volts	4.0		10.0	
22.a.B	Pulse Width	u sec	2.0		4.0	
22.a.C	Droop	volts			A/5	
22.a.D	Rise Time	u sec			0.2	
22.a.E	Backsawing	volts			4.0	
22.b.A	Amplitude	volts	4.0		10.0	
22.b.B	Pulse Width	u sec	2.0		4.0	
22.b.C	Droop	volts			A/5	
22.b.D	Rise Time	u sec			0.2	
22.b.E	Backsawing	volts			4.0	
24.a.A	Amplitude	volts	4.0		10.0	
24.a.B	Pulse Width	u sec	2.0		4.0	
24.a.C	Droop	volts			A/5	
24.a.D	Rise Time	u sec			.2	
24.a.E	Backsawing	volts			4.0	
24.b.A	Amplitude	volts	4.0		10.0	
24.b.B	Pulse Width	u sec	2.0		4.0	

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Chg. 7-5 8-6

APOLLO G&N  
EQUIPMENT TEST  
DATA SHEET 4 OF 7

JDC  
NO. 12621  
REV. G

JOB LGC OUTPUT TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ ACC
24.b.C	Droop	volts			A/5	
24.b.D	Rise Time	u sec			.2	
24.b.E	Backsawing	volts			4.0	
26.a.A	Amplitude	volts	4.0		10.0	
26.a.B	Pulse Width	u sec	2.0		4.0	
26.a.C	Droop	volts			A/5	
26.a.D	Rise Time	u sec			.2	
26.a.E	Backsawing	volts			4.0	
26.a.F	Noise	volts	0		.4	
26.b.A	Amplitude	volts	4.0		10.0	
26.b.B	Pulse Width	u sec	2.0		4.0	
26.b.C	Droop	volts			A/5	
26.b.D	Rise Time	u sec			.2	
26.b.E	Backsawing	volts			4.0	
26.b.F	Noise	volts	0		.4	
31.	LR Range Read	m sec	80.315			
32.A	Amplitude	volts	4.0		10.0	
32.B	Pulse Width	u sec	2.0		4.0	
32.C	Droop	volts			A/5	
32.D	Rise Time	u sec			0.20	
32.E	Backsawing	volts			4.0	
32.F	Noise	volts	0		0.4	
34	LR Range Gate	u sec	1.75		2.25	
35.A	Amplitude	volts	4.0		10.0	
35.B	Pulse Width	u sec	2.0		4.0	

DATE

FORM 00 147  
Chg. 7-5 8-6

APOLLO G&N  
EQUIPMENT TEST  
DATA SHEET 5 OF 7

JDC  
NO. 12621  
REV. G

JOB LGC OUTPUT TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ ACC
35.C	Droop	volts			A/5	
35.D	Rise Time	u sec			0.20	
35.E	Backsawing	volts			4.0	
35.F	Noise	volts	0		0.4	
38	LR V <sub>Z</sub> Read Cycle Timing	m sec	80.315			
40	LR V <sub>Z</sub> Gate Strobe Timing	u sec	1.75		2.25	
41.A	Amplitude	volts	4.0		10.0	
41.B	Pulse Width	u sec	2.0		4.0	
41.C	Droop	volts			A/5	
41.D	Rise Time	u sec			0.20	
41.E	Backsawing	volts			4.0	
41.F	Noise	volts	0		0.4	
44	LR V <sub>Y</sub> Read Cycle Timing	m sec	80.315			
46	LR V <sub>Y</sub> Gate Strobe Timing	u sec	1.75		2.25	
47.A	Amplitude	volts	4.0		10.0	
47.B	Pulse Width	u sec	2.0		4.0	
47.C	Droop	volts			A/5	
47.D	Rise Time	u sec			.20	
47.E	Backsawing	volts			4.0	
47.F	Noise	volts	0		0.4	
50	LR V <sub>X</sub> Read Cycle Timing	m sec	80.315			
53	LR V <sub>X</sub> Gate Strobe Timing	u sec	1.75		2.25	

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APOLLO G&N  
EQUIPMENT TEST  
DATA SHEET 6 OF 7

JDC  
NO. 12621  
REV. G

JOB LGC OUTPUT TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ ACC
53.A	Amplitude	volts	4.0		10.0	
53.B	Pulse Width	u sec	2.0		4.0	
53.C	Droop	volts			A/5	
53.D	Rise Time	u sec			0.2	
53.E	Backsawing	volts			4.0	
53.F	Noise	P-PV	0		0.4	
56	RR Range Rate Read Cycle Timing	m sec	80.935			
58	RR Range Rate Gate Strobe Timing	u sec	1.75		2.25	
59.A	Amplitude	volts	4.0		10.0	
59.B	Pulse Width	u sec	2.0		4.0	
59.C	Droop	volts			A/5	
59.D	Rise Time	u sec			0.2	
59.E	Backsawing	volts			4.0	
59.F	Noise	P-PV	0		0.4	
63	RR Range Read Cycle Timing	m sec	80.935			
63.A	Amplitude	volts	4.0		10.0	
63.B	Pulse Width	u sec	2.0		4.0	
63.C	Droop	volts			A/5	
63.D	Rise Time	u sec			0.2	
63.E	Backsawing	volts			4.0	
63.F	Noise	P-PV	0		0.4	
65	RR Range Gate Strobe Timing	u sec	1.75		2.25	
66.A	Amplitude	volts	4.0		10.0	
66.B	Pulse Width	u sec	2.0		4.0	
66.C	Droop	volts			A/5	

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APOLLO GAN  
EQUIPMENT TEST  
DATA SHEET 7 OF 7

JOB LOC OUTPUT TEST

JDC  
NO. 12821  
REV. G

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ/ACC
66.D	Rise Time	u sec			.20	
66.E	Backsawing	volts			4.0	
66.F	Noise	PP-V	0		0.4	
71.A	Amplitude	volts	4.0		10.0	
71.B	Pulse Width	u sec	2.0		4.0	
71.C	Drop	volts			A/5	
71.D	Rise Time	u sec			0.2	
71.E	Backsawing	volts			4.0	
72	DLNK Data	u sec			1 u sec	
	Syno Delay Time					
73.A	Amplitude	volts	5.0		9.0	
73.B	Pulse Width	u sec	2.0		6.0	
73.C	Drop	volts			A/5	
73.D	Rise Time	u sec			0.2	
73.E	Backsawing	volts			4.0	

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FORM C-117  
Chg. - 3-15







SUBSYSTEM LEM G &amp; N SYSTEM

ASSY

30. Make the following switch settings on the AGC INPUT COUNTERS portion of the XY Interface Panel:

- Selector to 12
- STANDARD RATE pushbutton - press to light
- POSITIVE pushbutton - press to light
- OUT IN pushbutton - press to light
- Press to light CH33-4, CH33-5, CH 33-8 pushbuttons on RDC Interface panel.

31. Perform the following DSKY operations:

- VERB 57 ENTR
- 00014 ENTR
- VERB 33 ENTR

Record the counter indication.

NOTE: If in the above step

the counter did not count or did not indicate about 80 milliseconds, press

RESET and adjust the INPUT

VOLTS RMS and TRIGGER

LEVEL controls concurrently

until a repeatable or satisfactory indication is present.

factory indication is present.

#### LR RANGE GATE STROBE TEST

32. Set SCOPE switch on XY Interface

Panel to DIFF T. Measure and record

oscilloscope indications A through F. (See

Figure 1.) After completing measurements,

set SCOPE switch to ALTERNATE S-T, and

oscilloscope MODE switch to ALT. Set

oscilloscope B switch to NORMAL DC.

#### LR RANGE GATE STROBE TIMING TEST

33. Set the CHANNEL S switches to 118 (LR RESET STROBE).

34. Determine the timing lag of a LR

Range Gate Strobe pulse (T-220) to a LR

Reset Strobe pulse (S-118) at their respective A/2 points.

LR SYNC FOR READOUT STROBE TEST

35. Set the CHANNEL S switches to 314

(LR SYNC FOR READOUT). Set SCOPE

switch on XY Interface Panel to DIFF S. Set

oscilloscope MODE switch to A + B. Set

oscilloscope B switch to INVERT DC. On XY

Interface panel set FREQ + PHASE switch to

OFF. Measure and record the oscilloscope

indications of A through F. (See Figure 1.)

LR RANGE DATA ACQUISITION TEST

36. Perform the following DSKY operations:

37. Repeat step 41.

38. Repeat step 41.

39. Repeat step 41.

40. Repeat step 41.

41. Repeat step 41.

42. Repeat step 41.

43. Repeat step 41.

44. Repeat step 41.

45. Repeat step 41.

46. Repeat step 41.

47. Repeat step 41.

48. Repeat step 41.

49. Repeat step 41.

50. Repeat step 41.

51. Repeat step 41.

52. Repeat step 41.

53. Repeat step 41.

54. Repeat step 41.

55. Repeat step 41.

56. Repeat step 41.

57. Repeat step 41.

58. Repeat step 41.

59. Repeat step 41.

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SUBSYSTEM LEM G &amp; N SYSTEM

ASSY

#### LR V<sub>Y</sub> GATE STROBE TIMING TEST

38. Enter VERB 33 and press the ENTR

pushbutton on the DSKY. Record the Pre-

quency Counter indications. Set FREQ +

PHASE switch on XY Interface panel to OFF.

LR V<sub>Z</sub> GATE STROBE TIMING TEST

39. Set the CHANNEL S switches to 118.

Set oscilloscope MODE switch to ALT. Set

oscilloscope B switch to NORM DC. Set

SCOPE switch on XY Interface Panel to

ALTERNATE S-T.

40. Determine and record the timing lag

of a LR V<sub>Z</sub> Gate Strobe pulse (T-219) to a

LR Reset Strobe pulse (S-118) at their respective A/2 points.

LR V<sub>Z</sub> GATE STROBE TEST

41. Set SCOPE switch on XY Interface

Panel to DIFF T. Set oscilloscope MODE

switch to A + B. Set oscilloscope B switch

to INVERT DC. Measure and record oscillo-

scope indications of A through F of Figure 1.

LR V<sub>Z</sub> DATA ACQUISITION TEST

42. Perform the following DSKY operations:

43. Repeat step 41.

44. Repeat step 41.

45. Repeat step 41.

46. Repeat step 41.

47. Repeat step 41.

48. Repeat step 41.

49. Repeat step 41.

50. Repeat step 41.

51. Repeat step 41.

52. Repeat step 41.

53. Repeat step 41.

54. Repeat step 41.

55. Repeat step 41.

56. Repeat step 41.

57. Repeat step 41.

58. Repeat step 41.

59. Repeat step 41.

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SUBSYSTEM LEM G &amp; N SYSTEM

ASSY

#### LR V<sub>X</sub> GATE STROBE TIMING TEST

38. Enter VERB 33 and press the ENTR

pushbutton on the DSKY. Record the Pre-

quency Counter indications. Set FREQ +

PHASE switch on XY Interface panel to OFF.

LR V<sub>X</sub> GATE STROBE TIMING TEST

39. Set the CHANNEL S switches to 118.

Set oscilloscope MODE switch to ALT. Set

oscilloscope B switch to NORM DC. Set

SCOPE switch on XY Interface Panel to

ALTERNATE S-T.

40. Determine and record the timing lag

of a LR V<sub>X</sub> Gate Strobe pulse (T-217) to a

LR Reset Strobe pulse (S-106) at their

respective A/2 points.

LR V<sub>X</sub> GATE STROBE TEST

41. Set SCOPE switch on XY Interface

Panel to DIFF T. Set oscilloscope MODE

switch to A + B. Set oscilloscope B switch

to INVERT DC. Measure and record oscillo-

scope indications of A through F of Figure 1.

LR V<sub>X</sub> DATA ACQUISITION TEST

42. Perform the following DSKY operations:

43. Repeat step 41.

44. Repeat step 41.

45. Repeat step 41.

46. Repeat step 41.

47. Repeat step 41.

48. Repeat step 41.

49. Repeat step 41.

50. Repeat step 41.

51. Repeat step 41.

52. Repeat step 41.

53. Repeat step 41.

54. Repeat step 41.

55. Repeat step 41.

56. Repeat step 41.

57. Repeat step 41.

58. Repeat step 41.

59. Repeat step 41.

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SUBSYSTEM LEM G &amp; N SYSTEM

ASSY

#### RR RANGE RATE DATA ACQUISITION TEST

40. Perform the following DSKY operations:

41. Repeat step 41.

42. Repeat step 41.

43. Repeat step 41.

44. Repeat step 41.

45. Repeat step 41.

46. Repeat step 41.

47. Repeat step 41.

48. Repeat step 41.

49. Repeat step 41.

50. Repeat step 41.

51. Repeat step 41.

52. Repeat step 41.

53. Repeat step 41.

54. Repeat step 41.

55. Repeat step 41.

56. Repeat step 41.

57. Repeat step 41.

58. Repeat step 41.

59. Repeat step 41.

60. Repeat step 41.

61. Repeat step 41.

62. Repeat step 41.

63. Repeat step 41.

64. Repeat step 41.

65. Repeat step 41.

66. Repeat step 41.

67. Repeat step 41.

68. Repeat step 41.

69. Repeat step 41.

70. Repeat step 41.

71. Repeat step 41.

72. Repeat step 41.

73. Repeat step 41.

74. Repeat step 41.

75. Repeat step 41.

76. Repeat step 41.

77. Repeat step 41.

78. Repeat step 41.

79. Repeat step 41.

80. Repeat step 41.

81. Repeat step 41.

82. Repeat step 41.

83. Repeat step 41.

84. Repeat step 41.

85. Repeat step 41.

86. Repeat step 41.

87. Repeat step 41.

88. Repeat step 41.

89. Repeat step 41.

90. Repeat step 41.

91. Repeat step 41.

92. Repeat step 41.

93. Repeat step 41.

94. Repeat step 41.

95. Repeat step 41.

96. Repeat step 41.

97. Repeat step 41.

98. Repeat step 41.

99. Repeat step 41.

100. Repeat step 41.

101. Repeat step 41.

102. Repeat step 41.

103. Repeat step 41.

104. Repeat step 41.

105. Repeat step 41.

106. Repeat step 41.

107. Repeat step 41.

108. Repeat step 41.

109. Repeat step 41.

110. Repeat step 41.

111. Repeat step 41.

112. Repeat step 41.

113. Repeat step 41.

114. Repeat step 41.

115. Repeat step 41.

116. Repeat step 41.

117. Repeat step 41.

118. Repeat step 41.

119. Repeat step 41.

120. Repeat step 41.

121. Repeat step 41.

122. Repeat step 41.

123. Repeat step 41.

124. Repeat step 41.

125. Repeat step 41.

126. Repeat step 41.

127. Repeat step 41.

128. Repeat step 41.

129. Repeat step 41.

130. Repeat step 41.

131. Repeat step 41.

132. Repeat step 41.

133. Repeat step 41.

134. Repeat step 41.

135. Repeat step 41.

136. Repeat step 41.

137. Repeat step 41.

138. Repeat step 41.

139. Repeat step 41.

140. Repeat step 41.

141. Repeat step 41.

142. Repeat step 41.

143. Repeat step 41.

144. Repeat step 41.

145. Repeat step 41.

146. Repeat step 41.

147. Repeat step 41.

148. Repeat step 41.

149. Repeat step 41.

L. 55000 ENTR ENTR  
M. 35757 ENTR ENTR  
N. 01750 ENTR

O. 00411 ENTR  
P. 01000 ENTR  
Q. VERB 25 NOUN 26 ENTR  
R. 04000 ENTR  
S. 01750 ENTR  
T. 00003 ENTR  
U. VERB 30 ENTR  
V. VERB 01 NOUN 01 ENTR  
W. 01000 ENTR  
X. Observe

Y. Row 1 indicates 77777  
Z. NOUN 01 ENTR  
aa. 01077 ENTR  
ab. Observe

If Row 1 does not indicate 77777, repeat step 69.  
70. Make the following switch settings on the XY Interface Panel:

a. DL ENABLE pushbutton - press to light  
b. WORD RATE 50 PPS pushbutton - press to light  
c. Press LOAD CHAN 8 200 OHMS and LOAD CHAN T 200 OHMS pushbuttons.

Set oscilloscope MODE switch to A+B. Set oscilloscope B switch to INVERT DC.  
d. SCOPE switch to DIFF T.

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76. Deactivate all switches on the XY Interface Panel. On the RDC Interface Panel, set CHAN V METERS switch to OFF and all other switches fully CCW. On the XY Interface Panel, press the WORD RATE 80 PPS pushbutton. The pushbutton shall light. Press the WORD RATE 300 PPS pushbutton. The pushbutton shall go out.

77. Perform the following DSKY operations:

a. VERB 36 ENTR

DATE 15 MAR 66

JDC NO. 12621  
REV. H  
INITIAL TDRR 27124

ASSEMBLY UNDER TEST				TEST HISTORY			
TITLE	DATE	START	END	SITE/LOCATION	DATE	START	END
SER. NO.	TIME	START	END	TOTAL ELAPSED			
MAJOR GROUND SUPPORT EQUIPMENT							
CONDUCTED BY NAME/AFFILIATION							
APPROVED BY NAME/AFFILIATION							
JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ ACC	
4.a	RCS Jet -X4U	vdc	3.0		6.0		
4.b	RCS Jet +X4D	vdc	3.0		6.0		
4.c	RCS Jet -X3U	vdc	3.0		6.0		
4.d	RCS Jet +X3D	vdc	3.0		6.0		
4.e	RCS Jet -X2U	vdc	3.0		6.0		
4.f	RCS Jet +X2D	vdc	3.0		6.0		
4.g	RCS Jet -X1U	vdc	3.0		6.0		
4.h	RCS Jet +X1D	vdc	3.0		6.0		
6.a	RCS Jet -X4U	vdc	9.1		10.1		
6.b	RCS Jet +X4D	vdc	9.1		10.1		
6.c	RCS Jet -X3U	vdc	9.1		10.1		
6.d	RCS Jet +X3D	vdc	9.1		10.1		
6.e	RCS Jet -X2U	vdc	9.1		10.1		
6.f	RCS Jet +X2D	vdc	9.1		10.1		
6.g	RCS Jet -X1U	vdc	9.1		10.1		
6.h	RCS Jet +X1D	vdc	9.1		10.1		
7.a	RCS Jet +Z3F	vdc	3.0		6.0		
7.b	RCS Jet -Z4F	vdc	3.0		6.0		

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JDC NO. 12621  
REV. H

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ ACC
7.d	RCS Jet -Z1F	vdc	3.0		6.0	
7.e	RCS Jet +Z2F	vdc	3.0		6.0	
7.f	RCS Jet -Y38	vdc	3.0		6.0	
7.g	RCS Jet -Y48	vdc	3.0		6.0	
7.h	RCS Jet +Y1X	vdc	3.0		6.0	
9.a	RCS Jet +Z3F	vdc	9.1		10.1	
9.b	RCS Jet -Z4F	vdc	9.1		10.1	
9.c	RCS Jet -Z1F	vdc	9.1		10.1	
9.d	RCS Jet +Z2F	vdc	9.1		10.1	
9.e	RCS Jet +Y28	vdc	9.1		10.1	
9.f	RCS Jet -Y38	vdc	9.1		10.1	
9.g	RCS Jet -Y48	vdc	9.1		10.1	
9.h	RCS Jet +Y18	vdc	9.1		10.1	
10	Eng On	vdc	2.0		5.0	
	Eng Off	vdc	2.0		5.0	
12	Eng On	vdc	9.0		11.0	
	Eng Off	vdc	9.0		11.0	
13.a	+Pitch Gimbal Trim	vdc	2.0		5.0	
13.b	-Pitch Gimbal Trim	vdc	2.0		5.0	
13.c	+Roll Gimbal Trim	vdc	2.0		5.0	
13.d	-Roll Gimbal Trim	vdc	2.0		5.0	
16.a	+Pitch Gimbal Trim	vdc	9.0		11.0	
16.b	-Pitch Gimbal Trim	vdc	9.0		11.0	
16.c	+Roll Gimbal Trim	vdc	9.0		11.0	
16.d	-Roll Gimbal Trim	vdc	9.0		11.0	
18A	Amplitude	volts	4.0		10.0	

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APOLLO G&N  
EQUIPMENT TEST  
DATA SHEET 3 OF 7

JDC  
NO. 12621  
REV. II

JOB LGC OUTPUT TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ/ACC
18B	Pulse Width	u sec	2.0		4.0	
18C	Droop	volts			A/5	
18D	Rise Time	u sec			0.20	
18E	Backsawing	volts			4.0	
18F	Noise	P-PV	4.0		+0.4	
20A	Amplitude	volts	4.0		10.0	
20B	Pulse Width	u sec	2.0		4.0	
20C	Droop	volts			A/5	
20D	Rise Time	u sec			0.20	
20E	Backsawing	volts			4.0	
20F	Noise	P-PV	4.0		+0.4	
22A.A	Amplitude	volts	4.0		10.0	
22A.B	Pulse Width	u sec	2.0		4.0	
22A.C	Droop	volts			A/5	
22A.D	Rise Time	u sec			0.2	
22A.E	Backsawing	volts			4.0	
22B.A	Amplitude	volts	4.0		10.0	
22B.B	Pulse Width	u sec	2.0		4.0	
22B.C	Droop	volts			A/5	
22B.D	Rise Time	u sec			0.2	
22B.E	Backsawing	volts			4.0	
24A.A	Amplitude	volts	4.0		10.0	
24A.B	Pulse Width	u sec	2.0		4.0	
24A.C	Droop	volts			A/5	
24A.D	Rise Time	u sec			.2	
24A.E	Backsawing	volts			4.0	
24B.A	Amplitude	volts	4.0		10.0	
24B.B	Pulse Width	u sec	2.0		4.0	

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JDC  
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JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ/ACC
24B.C	Droop	volts			A/5	
24B.D	Rise Time	u sec			.2	
24B.E	Backsawing	volts			4.0	
26A.A	Amplitude	volts	4.0		10.0	
26A.B	Pulse Width	u sec	2.5		3.5	
26A.C	Droop	volts			A/5	
26A.D	Rise Time	u sec			.2	
26A.E	Backsawing	volts			4.0	
26A.F	Noise	volts	0		.4	
26B.B	Amplitude	volts	4.0		10.0	
26B.C	Droop	u sec	2.5		3.5	
26B.D	Rise Time	volts			A/5	
26B.E	Backsawing	u sec			.2	
26B.F	Noise	volts	0		4.0	
31.	LR Range Read	m sec	80.315			
	Cycle Timing					
32.A	Amplitude	volts	4.0		10.0	
32.B	Pulse Width	u sec	2.5		3.5	
32.C	Droop	volts			A/5	
32.D	Rise Time	u sec			0.20	
32.E	Backsawing	volts			4.0	
32.F	Noise	volts	0		0.4	
34	LR Range Gate	u sec	1.75		2.25	
	Strobe Timing					
35.A	Amplitude	volts	4.0		10.0	
35.B	Pulse Width	u sec	2.5		3.5	

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DATA SHEET 5 OF 7

JDC  
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JOB LGC OUTPUT TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ/ACC
35.C	Droop	volts			A/5	
35.D	Rise Time	u sec			0.20	
35.E	Backsawing	volts			4.0	
35.F	Noise	volts	0		0.4	
38	LR V <sub>Z</sub> Read Cycle Timing	m sec	80.315			
40	LR V <sub>Z</sub> Gate Strobe Timing	u sec	1.75		2.25	
41.A	Amplitude	volts	4.0		10.0	
41.B	Pulse Width	u sec	2.5		3.5	
41.C	Droop	volts			A/5	
41.D	Rise Time	u sec			0.20	
41.E	Backsawing	volts			4.0	
41.F	Noise	volts	0		0.4	
44	LR V <sub>X</sub> Read Cycle Timing	m sec	80.315			
46	LR V <sub>X</sub> Gate Strobe Timing	u sec	1.75		2.25	
47.A	Amplitude	volts	4.0		10.0	
47.B	Pulse Width	u sec	2.5		3.5	
47.C	Droop	volts			A/5	
47.D	Rise Time	u sec			.20	
47.E	Backsawing	volts			4.0	
47.F	Noise	volts	0		0.4	
50	LR V <sub>X</sub> Read Cycle Timing	m sec	80.315			
52	LR V <sub>X</sub> Gate Strobe Timing	u sec	1.75		2.25	

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JOB LGC OUTPUT TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ/ACC
53.A	Amplitude	volts	4.0		10.0	
53.B	Pulse Width	u sec	2.5		3.5	
53.C	Droop	volts			A/5	
53.D	Rise Time	u sec			0.2	
53.E	Backsawing	volts			4.0	
53.F	Noise	P-PV	0		0.4	
56	RR Range Rate Read Cycle Timing	m sec	80.935			
58	RR Range Rate Gate Strobe Timing	u sec	1.75		2.25	
59.A	Amplitude	volts	4.0		10.0	
59.B	Pulse Width	u sec	2.5		3.5	
59.C	Droop	volts			A/5	
59.D	Rise Time	u sec			0.2	
59.E	Backsawing	volts			4.0	
59.F	Noise	P-PV	0		0.4	
62	RR Range Read Cycle Timing	m sec	80.935			
63.A	Amplitude	volts	4.0		10.0	
63.B	Pulse Width	u sec	2.5		3.5	
63.C	Droop	volts			A/5	
63.D	Rise Time	u sec			0.2	
63.E	Backsawing	volts			4.0	
63.F	Noise	P-PV	0		0.4	
65	RR Range Gate Strobe Timing	u sec	1.75		2.25	
66.A	Amplitude	volts	4.0		10.0	
66.B	Pulse Width	u sec	2.5		3.5	
66.C	Droop	volts			A/5	

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JOC  
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JOB LOC OUTPUT TEST

JIC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ A/C
66.D	Rise Time	u sec			.20	
66.E	Backsawing	volts			4.0	
66.F	Noise	PP-V	0		0.4	
71.A	Amplitude	volts	5.0		9.0	
71.B	Pulse Width	u sec	2.0		6.0	
71.C	Drop	volts			A/5	
71.D	Rise Time	u sec			0.2	
71.E	Backsawing	volts			4.0	
72	DLNK Data	u sec			1 u sec	
73.A	Amplitude	volts	5.0		9.0	
73.B	Pulse Width	u sec	2.0		6.0	
73.C	Drop	volts			A/5	
73.D	Rise Time	u sec			0.2	
73.E	Backsawing	volts			4.0	

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PAR 4 101.7  
Chg. 7 23-65



SUBSYSTEM LEM G & N SYSTEM ASSY.

DESCRIPTION This test is designed to check the discrete outputs of the RCS Jet and SCS command interface, and the pulse train outputs of the Main Engine command, Altitude meter, Landing Radar, Rendezvous Radar and Downlink Interface.

Rev.	Let.	Date	TORR NO.	PAGES REVISED	APPROVAL	REFERENCES
1	A	8-10-66	30531	ALL	MIT	NASA
2	B	10-6-66	31443	2-9	EA	JDC 12613
3	C	11-25-66	32082	2-9	EA	IMPORTANT
4	D	6-30-67	33038	ALL	EA	INTERVAL
5	E	8-10-67	34336	1, 8	EA	INTERVAL
6	F	8-31-67	34459	9	EA	TOOLS AND MATERIAL
7	G	2-6-68	35562	1	EA	TOOLS AND MATERIAL
8	H	4-10-68	36049	1-5, 8-10	EA	TOOLS AND MATERIAL
9	I	7-29-68	36598	4, 5	EA	TOOLS AND MATERIAL

IMPORTANT: 1. In some steps the DSKY operations and displays required when the LGC contains Program Aurora 88 (2021101-021 or -031) are different from the DSKY operations and displays required when the LGC contains Program Aurora 85 (2021101-011). These differences are noted within the procedures.

2. Insure that connector assembly (2003099) is re-moved and W226-P1 is connected to the LGC test connector before proceeding with this JDC.

VERIFICATION WITH SID REQUIRED BEFORE USE

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SUBSYSTEM LEM G & N SYSTEM ASSY

Row 2 indicates 30000.

9. Repeat step 7.

ENG ON-OFF ASC OR DESC TEST

10. Set the CHANNEL V selectors to 506 (ENG ON, ASC OR DESC) and 520 (ENG OFF, ASC OR DESC). Record the DCVM indications for each position.
11. Press the ENTR pushbutton on the DSKY. Observe Row 1 indicates 00012 and Row 2 indicates 37400.
12. Set the CHANNEL V selectors to 506 and 520. Record the DCVM indications for each position.

PITCH-ROLL GIMBAL TRIM TESTS

13. Set the CHANNEL V selectors to the positions specified below and record the DCVM indications for each position.

CHANNEL V GIMBAL TRIM

- a. 406 +Pitch
- b. 501 -Pitch
- c. 504 +Roll
- d. 617 -Roll

14. Observe that the RR AUTO ANGLE ENABLE and LR HOVER POS COM lamps on the Monitor Panel are lighted.
15. Press the ENTR pushbutton on the DSKY.
16. Repeat step 13. Observe that the lamps specified in step 14 are not lighted.

- Set the CHANNEL V selectors to 101. INC AND DEC THROTTLE RATE DESC ENG TEST
17. Make following switch settings and connections:

a. On XY Interface Panel set

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c. Observe

Row 1 indicates 00005

d. Observe

Row 2 indicates 00377

RCS JET ON-OFF TEST

4. Set the CHANNEL V selectors to the positions specified below and record the DCVM indications for each position.

CHANNEL V RCS JET

- a. 601 -X4U
- b. 602 +X4D
- c. 603 -X3U
- d. 604 +X3D
- e. 605 -X2U
- f. 606 +X2D
- g. 607 -X1U
- h. 608 +X1D

5. Press the ENTR pushbutton on the DSKY. Observe Row 1 indicates 00006 and Row 2 indicates 00377.
6. Repeat step 4.
7. Set the CHANNEL V selectors to the positions specified below and record the DCVM indications for each position.

CHANNEL V RCS JET

- a. 609 +Z3F
- b. 610 -Z4F
- c. 611 -Z1F
- d. 612 +Z2F
- e. 613 +Y2S
- f. 614 -Y3S
- g. 615 -Y4S
- h. 616 +Y1S

8. Press the ENTR pushbutton on the DSKY. Observe Row 1 indicates 00011 and

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SUBSYSTEM LEM G & N SYSTEM ASSY

1. SCOPE switch to DIFF T.
2. CHANNEL T to 213 (INC THROTTLE RATE DESCENT ENGINE)
3. LOAD CHAN T 200 OHMS - press to light

b. Connect coax jumpers as follows:

1. From SCOPE A on XY Interface Panel to Oscilloscope Channel A input jack.
2. From SCOPE A on XY Interface Panel to Oscilloscope EXT TRIG input jack.
3. From SCOPE B on XY Interface Panel to Oscilloscope Channel B input jack.

c. On Oscilloscope set

1. SOURCE switch to EXT.
2. MODE switch to A + B.
3. Scope B switch to INVERT DC.

18. Measure and record the oscilloscope indications of A through F. (See Figure 1.)

19. Press the ENTR pushbutton on the DSKY. The signal on the oscilloscope shall disappear.

20. Set the CHANNEL T switches to 214 (DEC THROTTLE RATE DESC ENGINE). Measure and record the oscilloscope indications of A through F. (See Figure 1.)

21. Press the ENTR pushbutton on the DSKY. The signal on the oscilloscope shall disappear.

22. Set the CHANNEL T switches to 317

(ALTITUDE "1") and 318 (ALTITUDE "0").

- Measure and record the oscilloscope indications of A through E for each position. (See Figure 1.)

23. Press the ENTR pushbutton on the DSKY. Set the CHANNEL T switches to 317 and 318 and observe that the signals on the oscilloscope have disappeared for each position.

24. Set CHANNEL T switches to 319 (ALTITUDE RATE "1") and 320 (ALTITUDE RATE "0"). Measure and record the oscilloscope indications of A through E for each position. (See Figure 1.)

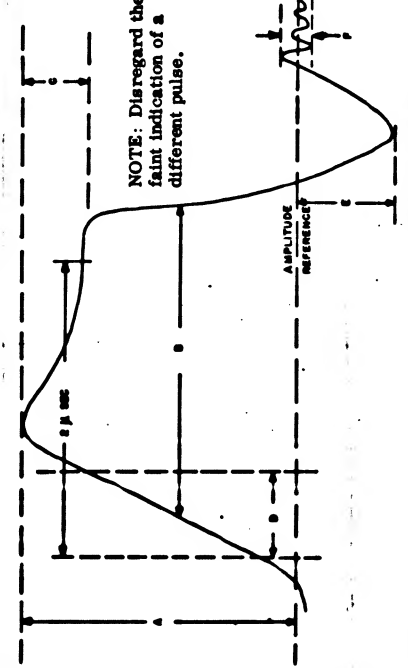
25. Press the ENTR pushbutton on the DSKY. Set the CHANNEL T switches to 319 and 320 and observe that the signal on the oscilloscope disappears for each position.

- RR AND LR RESET STROBE TEST
26. Press the LOAD CHAN S 200 OHMS pushbutton on the XY Interface Panel to ON.

- Set the SCOPE switch to DIFF S.
- Set the CHANNEL S switches to 105 (RR RESET STROBE) and 118 (LR RESET STROBE) and measure and record the oscilloscope indications of A through F for each position. (See Figure 1.)

- LR RANGE READ CYCLE TIMING TEST
27. Set the CHANNEL T switches to 220 (LR RANGE GATE STROBE) and CHANNEL S switches to 314 (LR SYNC FOR READ-OUTS).

SUBSYSTEM LEM G & N SYSTEM ASSY



- A - Amplitude: measured to pulse maximum positive level
- B - Pulse width: measured at A/2 level
- C - Drop: measured from pulse maximum positive level to level at 2 microseconds
- D - Rise Time: time required for pulse to rise from 10% to 90% of A
- E - Backswing: measured to signal maximum negative level
- F - Noise: (No Pulse)

Figure 1. Waveform Description

28. Set the FREQ + PHASE switch on the XY Interface Panel to FR T Test. Connect a coax jumper to CNTR-A and FREQ A AC on the Frequency Counter Panel. Connect a coax jumper to CNTR-B and STOP-B.
29. Set the Frequency Counter Panel controls as follows:

- a. INPUT VOLTS RMS selector to 6.4
- b. TRIGGER LEVEL control to mid range
- c. TIME selector to MS

- d. DISPLAY fully CCW but not into detent position
- e. GATE switch to AUTO
- f. FUNCTION switch to TIME A-B
- g. SLOPE to (+)

NOTE: Disregard the PROG and TRACKER alarms during the following test.

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SUBSYSTEM LEM G & N SYSTEM		ASSY	
30. Make the following switch settings on the AGC INPUT COUNTERS portion of the XY Interface Panel: a. Selector to 12 b. STANDARD RATE pushbutton - press to light c. POSITIVE pushbutton - press to light d. OUT IN pushbutton - press to light e. Press to light CH33-4, CH33-5, CH33-8 pushbuttons on RDC Interface panel. 31. Perform the following DSKY operations: a. VERB 24 NOUN 01 ENTR b. 00035 ENTR c. 00000 ENTR d. 00000 ENTR e. VERB 67 ENTR f. 00014 ENTR g. VERB 33 ENTR Record the counter indication. NOTE: If in the above step the counter did not count or did not indicate about 80 milliseconds, press RESET and adjust the INPUT VOLTS RMS and TRIGGER LEVEL controls concurrently until a repeatable or satisfactory indication is present. LR RANGE GATE STROBE TEST 32. Set SCOPE switch on XY Interface Panel to DIFF T. Measure and record oscilloscope indications A through F. (See Figure 1.) After completing measurements, set SCOPE switch to ALTERNATE S → T, and oscilloscope MODE switch to ALT. Set oscilloscope B switch to NORMAL DC.			
33. Set the CHANNEL 8 switches to 118 (LR RESET STROBE). 34. Determine the timing lag of a LR Range Gate Strobe pulse (T-220) to a LR Reset Strobe pulse (S-118) at their respective A/2 points. LR SYNC FOR READOUT STROBE TEST 35. Set the CHANNEL 8 switches to 314 (LR SYNC FOR READOUT). Set SCOPE switch on XY Interface Panel to DIFF S. Set oscilloscope MODE switch to A + B. Set oscilloscope B switch to INVERT DC. On XY Interface panel set FREQ + PHASE switch to OFF. Measure and record the oscilloscope indications of A through F. (See Figure 1.) LR RANGE DATA ACQUISITION TEST 36. Perform the following DSKY operations: a. VERB 14 NOUN 01 ENTR b. Address of LR Range data 03437 ENTR c. Observe Row 1 indicates 00011 d. Observe Row 2 indicates 37653 READ CYCLE TIMING TEST LR V <sub>X</sub> 37. Reset Frequency Counter. Set XY Interface Panel switches as follows: CHANNEL T to 219 (LR V <sub>X</sub> GATE STROBE) and FREQ + PHASE to FR T → S.			
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LR V <sub>Y</sub> READ CYCLE TIMING TEST 38. Enter VERB 33 and press the ENTR pushbutton on the DSKY. Record the Frequency Counter Indications. Set FREQ + PHASE switch on XY Interface panel to OFF. LR V <sub>Z</sub> GATE STROBE TIMING TEST 39. Set the CHANNEL 8 switches to 118. Set oscilloscope MODE switch to ALT. Set oscilloscope B switch to NORM DC. Set SCOPE switch on XY Interface Panel to ALTERNATE S → T. 40. Determine and record the Timing lag of a LR V <sub>Z</sub> Gate Strobe pulse (T-219) to a LR Reset Strobe pulse (S-118) at their respective A/2 points. LR V <sub>Z</sub> GATE STROBE TEST 41. Set SCOPE switch on XY Interface Panel to DIFF T. Set oscilloscope MODE switch to A + B. Set oscilloscope B switch to INVERT DC. Measure and record oscilloscope indications of A through F of Figure 1. LR V <sub>Z</sub> DATA ACQUISITION TEST NOTE: DSKY display shown in parenthesis in step 42 is applicable to Program Aurora 88 only. 42. Perform the following DSKY operations: a. VERB 14 NOUN 01 ENTR b. Address of V <sub>Z</sub> data 03437 ENTR c. Observe Row 1 indicates 00001 d. Observe Row 2 indicates 10437 (07777) LR V <sub>Y</sub> STROBE TEST 43. Repeat step 41. LR V <sub>Y</sub> DATA ACQUISITION TEST NOTE: DSKY display shown in parenthesis in step 43 is applicable to Program Aurora 88 only. 44. Perform the following DSKY operations: a. VERB 14 NOUN 01 ENTR b. Address of V <sub>Y</sub> data 03437 ENTR c. Observe Row 1 indicates 00001 d. Observe Row 2 indicates 10437 (07777) LR V <sub>Y</sub> GATE STROBE TIMING TEST 45. Set the CHANNEL 8 switches to 118. Set oscilloscope MODE switch to ALT. Set oscilloscope B switch to NORM DC. Set SCOPE switch on XY Interface Panel to ALTERNATE S → T. 46. Determine and record the timing lag of a LR V <sub>Y</sub> Gate Strobe pulse (T-218) to a LR Reset Strobe pulse (S-118) at their respective A/2 points. LR V <sub>Y</sub> STROBE TEST 47. Repeat step 41. LR V <sub>Y</sub> DATA ACQUISITION TEST NOTE: DSKY display shown in parenthesis in step 48 is applicable to Program Aurora 88 only. 48. Perform the following DSKY operations: a. VERB 14 NOUN 01 ENTR b. Address of V <sub>Y</sub> data 03437 ENTR c. Observe Row 1 indicates 00001 d. Observe Row 2 indicates 10437 (07777) DATE 15 MAR 66			

JOB	LGC OUTPUT TEST	JDC 12621 REV J	PAGE 7 OF 10
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c. Observe Row 1 indicates 00001 d. Observe Row 2 indicates 10437 (07777) LR V <sub>X</sub> READ CYCLE TIMING TEST 49. Reset Frequency Counter. Set XY Interface Panel switches as follows: CHANNEL T to 217 (LR V <sub>X</sub> GATE STROBE), CHANNEL 8 to 314, and FREQ + PHASE to FR T → S. 50. Enter VERB 33 and press the ENTR pushbutton on the DSKY. Record the Frequency Counter Indications. Set FREQ + PHASE switch on XY Interface panel to OFF. LR V <sub>X</sub> GATE STROBE TIMING TEST 51. Set the CHANNEL 8 switches to 118. Set oscilloscope MODE switch to ALT. Set oscilloscope B switch to NORM DC. Set SCOPE switch on XY Interface Panel to ALTERNATE S → T. 52. Determine and record the timing lag of a LR V <sub>X</sub> Gate Strobe pulse (T-217) to a LR Reset Strobe pulse (S-118) at their respective A/2 points. LR V <sub>X</sub> GATE STROBE TEST 53. Repeat step 41. LR V <sub>X</sub> DATA ACQUISITION TEST NOTE: DSKY display shown in parenthesis in step 54 is applicable to Program Aurora 88 only. 54. Perform the following DSKY operations: a. VERB 14 NOUN 01 ENTR b. Address of V <sub>X</sub> data 03437 ENTR c. Observe Row 1 indicates 00001 d. Observe Row 2 indicates 10437 (07777) RR RANGE RATE READ CYCLE TIMING TEST 55. Reset Frequency Counter. Set XY Interface Panel switches as follows: CHANNEL T to 216 (RR RANGE RATE STROBE), CHANNEL 8 to 313, and FREQ + PHASE to FR T → S. 56. Enter VERB 33 and press the ENTR pushbutton on the DSKY. Record the Frequency Counter Indications. Set FREQ + PHASE switch on XY Interface panel to OFF. RR RANGE RATE GATE STROBE TIMING TEST 57. Set the CHANNEL 8 switches to 118. Set oscilloscope MODE switch to ALT. Set oscilloscope B switch to NORM DC. Set SCOPE switch on XY Interface Panel to ALTERNATE S → T. 58. Determine and record the timing lag of a RR Range Rate Gate Strobe pulse (T-216) to a RR Reset Strobe pulse (S-105) at their respective A/2 points. RR RANGE RATE GATE STROBE TEST 59. Repeat step 41.			
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JOB	LGC OUTPUT TEST	JDC 12621 REV J	PAGE 8 OF 10
SUBSYSTEM LEM G & N SYSTEM		ASSY	
65. Determine and record the timing lag of a RR Range Gate Strobe pulse (T-215) to a RR Reset Strobe pulse (S-105) at their respective A/2 points. RR RANGE GATE STROBE TEST 66. Repeat step 41. RR RANGE DATA ACQUISITION TEST 67. Perform the following DSKY operations: a. VERB 14 NOUN 01 ENTR b. Address of RR Range data 03437 ENTR c. Observe Row 1 indicates 00017 d. Observe Row 2 indicates 37770 68. Deactivate all switches on the XY Interface Panel. Enter VERB 36 and press the ENTR pushbutton on the DSKY. DOWN LINK TELEMETRY TEST 69. Perform the following DSKY operations: a. VERB 21 NOUN 01 ENTR b. 01750 ENTR c. 11753 ENTR d. NOUN 15 ENTR e. 01755 ENTR ENTR f. 04353 ENTR ENTR g. 00100 ENTR ENTR h. 77777 ENTR ENTR i. 55753 ENTR ENTR j. 31754 ENTR ENTR DATE 15 MAR 66			

k. 55000 ENTR ENTR  
l. 25757 ENTR ENTR  
m. 01760 ENTR  
n. NOUN 01  
o. 00411 ENTR  
p. 01000 ENTR  
q. VERB 25 NOUN 26 ENTR  
r. 04000 ENTR  
s. 01750 ENTR  
t. 00003 ENTR  
u. VERB 30 ENTR  
v. VERB 01 NOUN 01 ENTR  
w. 01000 ENTR  
x. Observe  
Row 1 indicates 77777  
y. NOUN 01 ENTR  
z. 01077 ENTR  
aa. Observe  
Row 1 indicates 77777  
If Row 1 does not indicate 77777, repeat step 69.

70. Make the following switch settings on the XY Interface Panel:  
a. DL ENABLE pushbutton - press to light  
b. WORD RATE 50 PPS pushbutton - press to light  
c. Press LOAD CHAN 8 200 OHMS and LOAD CHAN T 200 OHMS pushbuttons. Set oscilloscope MODE switch to A+B. Set oscilloscope B switch to INVERT DC.  
d. SCOPE switch to DIFF T.

71. Set the CHANNEL T switches to 102 (DLNK DATA). Measure and record the oscilloscope indications of A through E. (See Figure 1.)  
72. Set the CHANNEL S switches to 307 (DLNK SYNC). Set oscilloscope MODE switch to ALT. Measure and record the delay of the DLNK DATA pulse with respect to the DLNK SYNC pulse.  
73. Press the WORD RATE 10 PPS pushbutton, the pushbutton shall light. Press the WORD RATE 50 PPS pushbutton, the pushbutton shall go out. Set oscilloscope MODE switch to A+B. Set B switch to INVERT DC. Set SCOPE switch on XY Interface Panel to DIFF T. Repeat step 71.  
74. Press the WORD RATE 300 PPS pushbutton, the pushbutton shall light. Press the WORD RATE 10 PPS pushbutton, the pushbutton shall go out.

NOTE: The PROG alarm on the DSKY shall light.

75. Perform the following DSKY operations:  
a. VERB 01 NOUN 10 ENTR  
b. 00033 ENTR  
c. Observe  
Row 1 indicates X3XXX

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76. Deactivate all switches on the XY Interface Panel. On the RDC Interface Panel, set CHAN V METERS switch to OFF and all other switches fully CCW. On the XY Interface Panel, press the WORD RATE 80 PPS pushbutton. The pushbutton shall light. Press the WORD RATE 300 PPS pushbutton. The pushbutton shall go out.  
77. Perform the following DSKY operations:  
a. VERB 36 ENTR

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JOB LGC OUTPUT TEST

JDC  
NO. 12621  
REV. J  
INITIAL TDOR 27131

ASSEMBLY UNDER TEST				TEST HISTORY			
TITLE _____		DATE _____	START _____	END _____	SITE / LOCATION _____		
SER. NO. _____ DWG _____ REV. _____		TIME _____	START _____	END _____	TOTAL ELAPSE _____		
MAJOR GROUND SUPPORT EQUIPMENT							
NAME _____		SER. NO. _____		CAL DATE _____			
NAME _____		SER. NO. _____		CAL DATE _____			
CONDUCTED BY _____		NAME/AFFILIATION _____		APPROVED BY _____		NAME/AFFILIATION _____	
JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ /	ACC
4.a	RCS Jet -X4U	vdc	3.0		6.0		
4.b	RCS Jet +X4D	vdc	3.0		6.0		
4.c	RCS Jet -X3U	vdc	3.0		6.0		
4.d	RCS Jet +X3D	vdc	3.0		6.0		
4.e	RCS Jet -X2U	vdc	3.0		6.0		
4.f	RCS Jet +X2D	vdc	3.0		6.0		
4.g	RCS Jet -X1U	vdc	3.0		6.0		
4.h	RCS Jet +X1D	vdc	3.0		6.0		
6.a	RCS Jet -X4U	vdc	9.1		10.1		
6.b	RCS Jet +X4D	vdc	9.1		10.1		
6.c	RCS Jet -X3U	vdc	9.1		10.1		
6.d	RCS Jet +X3D	vdc	9.1		10.1		
6.e	RCS Jet -X2U	vdc	9.1		10.1		
6.f	RCS Jet +X2D	vdc	9.1		10.1		
6.g	RCS Jet -X1U	vdc	9.1		10.1		
6.h	RCS Jet +X1D	vdc	9.1		10.1		
7.a	RCS Jet +Z3F	vdc	3.0		6.0		
7.b	RCS Jet -Z4F	vdc	3.0		6.0		

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APOLLO G&N  
EQUIPMENT TEST  
DATA SHEET 2 OF 7

JOB LGC OUTPUT TEST

JDC  
NO. 12621  
REV. J

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ	ACC
7.c	RCS Jet -Z1F	vdc	3.0		6.0		
7.d	RCS Jet -Z2F	vdc	3.0		6.0		
7.e	RCS Jet +Y2S	vdc	3.0		6.0		
7.f	RCS Jet -Y3S	vdc	3.0		6.0		
7.g	RCS Jet -Y4S	vdc	3.0		6.0		
7.h	RCS Jet +Y1X	vdc	3.0		6.0		
9.a	RCS Jet +Z3F	vdc	9.1		10.1		
9.b	RCS Jet -Z4F	vdc	9.1		10.1		
9.c	RCS Jet -Z1F	vdc	9.1		10.1		
9.d	RCS Jet +Z2F	vdc	9.1		10.1		
9.e	RCS Jet +Y2S	vdc	9.1		10.1		
9.f	RCS Jet -Y3S	vdc	9.1		10.1		
9.g	RCS Jet -Y4S	vdc	9.1		10.1		
9.h	RCS Jet +Y1S	vdc	9.1		10.1		
10	Eng On	vdc	2.0		5.0		
	Eng Off	vdc	2.0		5.0		
12	Eng On	vdc	9.0		11.0		
	Eng Off	vdc	9.0		11.0		
13.a	+Pitch Gimbal Trim	vdc	2.0		5.0		
13.b	-Pitch Gimbal Trim	vdc	2.0		5.0		
13.c	+Roll Gimbal Trim	vdc	2.0		5.0		
13.d	-Roll Gimbal Trim	vdc	2.0		5.0		
16.a	+Pitch Gimbal Trim	vdc	9.0		11.0		
16.b	-Pitch Gimbal Trim	vdc	9.0		11.0		
16.c	+Roll Gimbal Trim	vdc	9.0		11.0		
16.d	-Roll Gimbal Trim	vdc	9.0		11.0		
18A	Amplitude	volts	4.0		10.0		

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EQUIPMENT TEST  
DATA SHEET 3 OF 7

JDC  
NO. 12621  
REV. J

JOB LGC OUTPUT TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ ACC
18B	Pulse Width	u sec	2.0		4.0	
18C	Droop	volts			A/5	
18D	Rise Time	u sec			0.20	
18E	Backsawing	volts			4.0	
18F	Noise above reference	P-PV			+0.4	
	Noise below reference	P-PV	-4.0			
20A	Amplitude	volts	4.0		10.0	
20B	Pulse Width	u sec	2.0		4.0	
20C	Droop	volts			A/5	
20D	Rise Time	u sec			0.20	
20E	Backsawing	volts			4.0	
20F	Noise above reference	P-PV			+0.4	
	Noise below reference	P-PV	-4.0			
22.a.A	Amplitude	volts	4.0		10.0	
22.a.B	Pulse Width	u sec	2.0		4.0	
22.a.C	Droop	volts			A/5	
22.a.D	Rise Time	u sec			0.2	
22.a.E	Backsawing	volts			4.0	
22.b.A	Amplitude	volts	4.0		10.0	
22.b.B	Pulse Width	u sec	2.0		4.0	
22.b.C	Droop	volts			A/5	
22.b.D	Rise Time	u sec			0.2	
22.b.E	Backsawing	volts			4.0	
24.a.A	Amplitude	volts	4.0		10.0	
24.a.B	Pulse Width	u sec	2.0		4.0	

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EQUIPMENT TEST  
DATA SHEET 4 OF 7

JDC  
NO. 12621  
REV. J

JOB LGC OUTPUT TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ ACC
24.a.C	Droop	volts			A/5	
24.a.D	Rise Time	u sec			.2	
24.a.E	Backsawing	volts			4.0	
24.b.A	Amplitude	volts	4.0		10.0	
24.b.B	Pulse Width	u sec	2.0		4.0	
24.b.C	Droop	volts			A/5	
24.b.D	Rise Time	u sec			.2	
24.b.E	Backsawing	volts			4.0	
26.a.A	Amplitude	volts	4.0		10.0	
26.a.B	Pulse Width	u sec	2.5		3.5	
26.a.C	Droop	volts			A/5	
26.a.D	Rise Time	u sec			.2	
26.a.E	Backsawing	volts			4.0	
26.a.F	Noise	volts	0		.4	
26.b.A	Amplitude	volts	4.0		10.0	
26.b.B	Pulse Width	u sec	2.5		3.5	
26.b.C	Droop	volts			A/5	
26.b.D	Rise Time	u sec			.2	
26.b.E	Backsawing	volts			4.0	
26.b.F	Noise	volts	0		.4	
31.	LR Range Read Cycle Timing	m sec	80.315			
32.A	Amplitude	volts	4.0		10.0	
32.B	Pulse Width	u sec	2.5		3.5	
32.C	Droop	volts			A/5	
32.D	Rise Time	u sec			0.20	
32.E	Backsawing	volts			4.0	
32.F	Noise	volts	0		0.4	

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EQUIPMENT TEST  
DATA SHEET 5 OF 7

JDC  
NO. 12621  
REV. J

JOB LGC OUTPUT TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ ACC
34	LR Range Gate Strobe Timing	u sec	1.75		2.25	
35.A	Amplitude	volts	4.0		10.0	
35.B	Pulse Width	u sec	2.5		3.5	
35.C	Droop	volts			A/5	
35.D	Rise Time	u sec			0.20	
35.E	Backsawing	volts			4.0	
35.F	Noise	volts	0		0.4	
38	LR V <sub>Z</sub> Read Cycle Timing	m sec	80.315			
40	LR V <sub>Z</sub> Gate Strobe Timing	u sec	1.75		2.25	
41.A	Amplitude	volts	4.0		10.0	
41.B	Pulse Width	u sec	2.5		3.5	
41.C	Droop	volts			A/5	
41.D	Rise Time	u sec			0.20	
41.E	Backsawing	volts			4.0	
41.F	Noise	volts	0		0.4	
44	LR V <sub>Y</sub> Read Cycle Timing	m sec	80.315			
46	LR V <sub>Y</sub> Gate Strobe Timing	u sec	1.75		2.25	
47.A	Amplitude	volts	4.0		10.0	
47.B	Pulse Width	u sec	2.5		3.5	
47.C	Droop	volts			A/5	
47.D	Rise Time	u sec			.20	
47.E	Backsawing	volts			4.0	
47.F	Noise	volts	0		0.4	

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EQUIPMENT TEST  
DATA SHEET 6 OF 7

JDC  
NO. 12621  
REV. J

JOB LGC OUTPUT TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ ACC
50	LR V <sub>X</sub> Read Cycle Timing	m sec	80.315			
52	LR V <sub>X</sub> Gate Strobe Timing	u sec	1.75		2.25	
53.A	Amplitude	volts	4.0		10.0	
53.B	Pulse Width	u sec	2.5		3.5	
53.C	Droop	volts			A/5	
53.D	Rise Time	u sec			0.2	
53.E	Backsawing	volts			4.0	
53.F	Noise	P-PV	0		0.4	
56	RR Range Rate Read Cycle Timing	m sec	80.935			
58	RR Range Rate Gate Strobe Timing	u sec	1.75		2.25	
59.A	Amplitude	volts	4.0		10.0	
59.B	Pulse Width	u sec	2.5		3.5	
59.C	Droop	volts			A/5	
59.D	Rise Time	u sec			0.2	
59.E	Backsawing	volts			4.0	
59.F	Noise	P-PV	0		0.4	
62	RR Range Read Cycle Timing	m sec	80.935			
63.A	Amplitude	volts	4.0		10.0	
63.B	Pulse Width	u sec	2.5		3.5	
63.C	Droop	volts			A/5	
63.D	Rise Time	u sec			0.2	
63.E	Backsawing	volts			4.0	
63.F	Noise	P-PV	0		0.4	

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SUBSYSTEM	LEM G & N SYSTEM	ASSY
30. Make the following switch settings on the AGC INPUT COUNTERS portion of the XY Interface Panel:		
a. Selector to 12		
b. STANDARD RATE pushbutton - press to light		
c. POSITIVE pushbutton - press to light		
d. OUT IN pushbutton - press to light		
e. Press to light CH33-4, CH33-5, CH33-8 pushbuttons on RDC interface panel.		
31. Perform the following DSKY operations:		
a. VERB 24 NOUN 01 ENTR		
b. 00035 ENTR		
c. 00000 ENTR		
d. 00000 ENTR		
e. VERB 57 ENTR		
f. 00014 ENTR		
g. VERB 33 ENTR		
Record the counter indication.		
NOTE: If in the above step the counter did not count or did not indicate about 80 milliseconds, press RESET and adjust the INPUT VOLTS RMS and TRIGGER LEVEL controls concurrently until a repeatable or satisfactory indication is present.		
LR RANGE GATE STROBE TEST		
32. Set SCOPE switch on XY Interface Panel to DIFF T. Measure and record oscilloscope indications A through F. (See Figure 1.) After completing measurements, set SCOPE switch to ALTERNATE S→T, and oscilloscope MODE switch to ALT. Set oscilloscope B switch to NORMAL DC.		

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SUBSYSTEM	LEM G & N SYSTEM	ASSY
33. Enter VERB 33 and press the ENTR pushbutton on the DSKY. Record the Frequency Counter Indications. Set FREQ + PHASE switch on XY Interface panel to OFF.		
34. Determine the timing lag of a LR Range Gate Strobe pulse (T-220) to a LR Reset Strobe pulse (S-118) at their respective A/2 points.		
35. Set the CHANNEL S switches to 118. LR SYNC FOR READOUT STROBE TEST		
36. Set the CHANNEL S switches to 314. LR SYNC FOR READOUT. Set SCOPE switch on XY Interface Panel to DIFF S. Set oscilloscope MODE switch to A + B. Set oscilloscope B switch to INVERT DC. On XY Interface panel set FREQ + PHASE switch to OFF. Measure and record the oscilloscope indications of A through F. (See Figure 1.)		
LR RANGE DATA ACQUISITION TEST		
36. Perform the following DSKY operations:		
a. VERB 14 NOUN 01 ENTR		
b. Address of LR Range data 03437		
c. Observe Row 1 indicates 00011		
d. Observe Row 2 indicates 37653		
READ CYCLE TIMING TEST LR V <sub>Z</sub>		
37. Reset Frequency Counter. Set XY Interface Panel switches as follows:		
CHANNEL T to 219 (LR V <sub>Z</sub> GATE STROBE) and FREQ + PHASE to FR T → S.		

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SUBSYSTEM	LEM G & N SYSTEM	ASSY
a. Observe Row 1 indicates 00001		
d. Observe Row 2 indicates 10437 (07777)		
LR V <sub>X</sub> READ CYCLE TIMING TEST		
49. Reset Frequency Counter. Set XY Interface Panel switches as follows:		
CHANNEL T to 217 (LR V <sub>X</sub> GATE STROBE), CHANNEL S to 314, and FREQ + PHASE to FR T → S.		
50. Enter VERB 33 and press the ENTR pushbutton on the DSKY. Record the Frequency Counter Indication. Set FREQ + PHASE switch on XY Interface panel to OFF.		
51. Set the CHANNEL S switches to 118. LR V <sub>X</sub> GATE STROBE TIMING TEST		
Set oscilloscope MODE switch to ALT. Set oscilloscope B switch to NORM DC. Set SCOPE switch on XY Interface Panel to ALTERNATE S→T.		
52. Determine and record the timing lag of a LR V <sub>X</sub> Gate Strobe pulse (T-217) to a LR Reset Strobe pulse (S-118) at their respective A/2 points.		
LR V <sub>X</sub> GATE STROBE TEST		
53. Repeat step 41.		
LR V <sub>X</sub> DATA ACQUISITION TEST		
NOTE: DSKY display shown in parenthesis in step 54 is applicable to Program Aurora 88 only.		
54. Perform the following DSKY operations:		
a. VERB 14 NOUN 01 ENTR		

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SUBSYSTEM	LEM G & N SYSTEM	ASSY
RR RANGE RATE DATA ACQUISITION TEST		
59. Perform the following DSKY operations:		
a. VERB 14 NOUN 01 ENTR		
b. Address of RR Range data 03437		
c. Observe Row 1 indicates 77777		
d. Observe Row 2 indicates 36627		
RR RANGE READ CYCLE TIMING TEST		
61. Reset Frequency Counter. Set XY Interface Panel switches as follows:		
CHANNEL T to 215 (RR RANGE GATE STROBE), CHANNEL S to 313 (RR SYNC FOR READOUT), and FREQ + PHASE switch to FR T → S.		
62. Enter VERB 33 and press the ENTR pushbutton on the DSKY. Record the Frequency Counter Indication. Set FREQ + PHASE switch on XY Interface panel to OFF.		
RR SYNC FOR READOUT STROBE TEST		
63. Repeat step 41.		
RR RANGE GATE STROBE TIMING TEST		
64. Set oscilloscope MODE switch to ALT. Set oscilloscope B switch to NORM DC. Set SCOPE switch on XY Interface panel to ALTERNATE S→T and set the CHANNEL S switches to 105.		
65. Determine and record the timing lag of a RR Range Gate Strobe pulse (T-215) to		

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k. 55000 ENTR ENTR  
l. 25787 ENTR ENTR  
m. 01750 ENTR  
n. NOUN 01 ENTR  
o. 00411 ENTR  
p. 01000 ENTR  
q. VERB 25 NOUN 26 ENTR  
r. 04000 ENTR  
s. 01750 ENTR  
t. 00003 ENTR  
u. VERB 30 ENTR  
v. VERB 01 NOUN 01 ENTR  
w. 01000 ENTR  
x. Observe  
Row 1 indicates 77777  
y. NOUN 01 ENTR  
z. 01077 ENTR  
aa. Observe  
Row 1 indicates 77777  
If Row 1 does not indicate 77777, repeat step 69.  
70. Make the following switch settings on the XY Interface Panel:  
a. DL ENABLE pushbutton - press to light  
b. WORD RATE 50 PPS pushbutton - press to light  
c. Press LOAD CHAN S 200 OHMS and LOAD CHAN T 200 OHMS pushbuttons.  
Set oscilloscope MODE switch to A+B. Set oscilloscope B switch to INVERT DC.  
d. SCOPE switch to DIFF T.

71. Set the CHANNEL T switches to 113 (DLNK DATA). Measure and record the oscilloscope indications of A through E. (See Figure 1.)  
72. Set the CHANNEL S switches to 307 (DLNK SYNC). Set oscilloscope MODE switch to ALT. Measure and record the delay of the DLNK DATA pulse with respect to the DLNK SYNC pulse.  
73. Press the WORD RATE 10 PPS pushbutton. The pushbutton shall light. Press the WORD RATE 50 PPS pushbutton. The pushbutton shall go out. Set oscilloscope MODE switch to A+B. Set B switch to INVERT DC. Set SCOPE switch on XY Interface Panel to DIFF T. Repeat step 71.  
74. Press to light WORD RATE 300 PPS pushbutton and press to extinguish WORD RATE 10 PPS pushbutton. When KEY REL indicator on DSKY flashes, press KEY REL pushbutton. Observe the DSKY displays VERB 05 NOUN 31. Row 1 indicates 01106, and PROG indicator is lighted.

75. Perform the following DSKY operations:  
a. VERB 01 NOUN 10 ENTR  
b. 00033 ENTR  
c. Observe  
Row 1 indicates X3XXX

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ASSEMBLY UNDER TEST			TEST HISTORY		
TITLE	DATE	START	END	DATE	LOCATION
SER. NO.	DWG	REV	TIME	START	END
MAJOR GROUND SUPPORT EQUIPMENT					
NAME	SER. NO.	DATE	NAME	SER. NO.	DATE
NAME	SER. NO.	DATE	NAME	SER. NO.	DATE
CONDUCTED BY			APPROVED BY		
JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE
4.a	RCS Jet -X4U	vdc	3.0		6.0
4.b	RCS Jet +X4D	vdc	3.0		6.0
4.c	RCS Jet -X3U	vdc	3.0		6.0
4.d	RCS Jet +X3D	vdc	3.0		6.0
4.e	RCS Jet -X2U	vdc	3.0		6.0
4.f	RCS Jet +X2D	vdc	3.0		6.0
4.g	RCS Jet -X1U	vdc	3.0		6.0
4.h	RCS Jet +X1D	vdc	3.0		6.0
6.a	RCS Jet -X4U	vdc	9.1		10.1
6.b	RCS Jet +X4D	vdc	9.1		10.1
6.c	RCS Jet -X3U	vdc	9.1		10.1
6.d	RCS Jet +X3D	vdc	9.1		10.1
6.e	RCS Jet -X2U	vdc	9.1		10.1
6.f	RCS Jet +X2D	vdc	9.1		10.1
6.g	RCS Jet -X1U	vdc	9.1		10.1
6.h	RCS Jet +X1D	vdc	9.1		10.1
7.a	RCS Jet +X3F	vdc	3.0		6.0
7.b	RCS Jet -X4F	vdc	3.0		6.0

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76. Deactivate all switches and pushbuttons on the XY Interface Panel and the RDC Interface Panel. On the RDC Interface Panel, set CHAN V METERS switch to OFF and all other switches fully CCW. On the XY Interface Panel, press to light the WORD RATE 50 PPS and the DL ENABLE pushbuttons. Insure that the WORD RATE 300 PPS pushbutton is out.

77. Perform the following DSKY operations:

a. VERB 36 ENTR

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JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ ACC
7.c	RCS Jet -Z1F	vdc	3.0		6.0	
7.d	RCS Jet +Z2F	vdc	3.0		6.0	
7.e	RCS Jet +Y2S	vdc	3.0		6.0	
7.f	RCS Jet -Y3S	vdc	3.0		6.0	
7.g	RCS Jet -Y4S	vdc	3.0		6.0	
7.h	RCS Jet +Y1X	vdc	3.0		6.0	
9.a	RCS Jet +Z3F	vdc	9.1		10.1	
9.b	RCS Jet -Z4F	vdc	9.1		10.1	
9.c	RCS Jet -Z1F	vdc	9.1		10.1	
9.d	RCS Jet +Z2F	vdc	9.1		10.1	
9.e	RCS Jet +Y2S	vdc	9.1		10.1	
9.f	RCS Jet -Y3S	vdc	9.1		10.1	
9.g	RCS Jet -Y4S	vdc	9.1		10.1	
9.h	RCS Jet +Y1S	vdc	9.1		10.1	
10	Eng On	vdc	2.0		5.0	
	Eng Off	vdc	2.0		5.0	
12	Eng On	vdc	9.0		11.0	
	Eng Off	vdc	9.0		11.0	
13.a	+Pitch Gimbal Trim	vdc	2.0		5.0	
13.b	-Pitch Gimbal Trim	vdc	2.0		5.0	
13.c	+Roll Gimbal Trim	vdc	2.0		5.0	
13.d	-Roll Gimbal Trim	vdc	2.0		5.0	
16.a	+Pitch Gimbal Trim	vdc	9.0		11.0	
16.b	-Pitch Gimbal Trim	vdc	9.0		11.0	
16.c	+Roll Gimbal Trim	vdc	9.0		11.0	
16.d	-Roll Gimbal Trim	vdc	9.0		11.0	
18A	Amplitude	volts	4.0		10.0	

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EQUIPMENT TEST  
DATA SHEET 3 OF 7

JDC  
NO. 12621  
REV. K

JOB LGC OUTPUT TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ/ACC
18B	Pulse Width	u sec	2.0		4.0	
18C	Drop	volts			A/5	
18D	Rise Time	u sec			0.20	
18E	Backsawing	volts			4.0	
18F	Noise above reference	P-PV			+0.4	
	Noise below reference	P-PV	-4.0			
20A	Amplitude	volts	4.0		10.0	
20B	Pulse Width	u sec	2.0		4.0	
20C	Drop	volts			A/5	
20D	Rise Time	u sec			0.20	
20E	Backsawing	volts			4.0	
20F	Noise above reference	P-PV			+0.4	
	Noise below reference	P-PV	-4.0			
22.a.A	Amplitude	volts	4.0		10.0	
22.a.B	Pulse Width	u sec	2.0		4.0	
22.a.C	Drop	volts			A/5	
22.a.D	Rise Time	u sec			0.2	
22.a.E	Backsawing	volts			4.0	
22.b.A	Amplitude	volts	4.0		10.0	
22.b.B	Pulse Width	u sec	2.0		4.0	
22.b.C	Drop	volts			A/5	
22.b.D	Rise Time	u sec			0.2	
22.b.E	Backsawing	volts			4.0	
24.a.A	Amplitude	volts	4.0		10.0	
24.a.B	Pulse Width	u sec	2.0		4.0	

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EQUIPMENT TEST  
DATA SHEET 4 OF 7

JDC  
NO. 12621  
REV. K

JOB LGC OUTPUT TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ/ACC
24.a.C	Drop	volts			A/5	
24.a.D	Rise Time	u sec			.2	
24.a.E	Backsawing	volts			4.0	
24.b.A	Amplitude	volts	4.0		10.0	
24.b.B	Pulse Width	u sec	2.0		4.0	
24.b.C	Drop	volts			A/5	
24.b.D	Rise Time	u sec			.2	
24.b.E	Backsawing	volts			4.0	
26.a.A	Amplitude	volts	4.0		10.0	
26.a.B	Pulse Width	u sec	2.5		3.5	
26.a.C	Drop	volts			A/5	
26.a.D	Rise Time	u sec			.2	
26.a.E	Backsawing	volts			4.0	
26.a.F	Noise	volts	0		.4	
26.b.A	Amplitude	volts	4.0		10.0	
26.b.B	Pulse Width	u sec	2.5		3.5	
26.b.C	Drop	volts			A/5	
26.b.D	Rise Time	u sec			.2	
26.b.E	Backsawing	volts			4.0	
26.b.F	Noise	volts	0		.4	
31.	LR Range Read Cycle Timing	m sec	80.315			
32.A	Amplitude	volts	4.0		10.0	
32.B	Pulse Width	u sec	2.5		3.5	
32.C	Drop	volts			A/5	
32.D	Rise Time	u sec			0.20	
32.E	Backsawing	volts			4.0	
32.F	Noise	volts	0		0.4	

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EQUIPMENT TEST  
DATA SHEET 5 OF 7

JDC  
NO. 12621  
REV. K

JOB LGC OUTPUT TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ/ACC
34	LR Range Gate Strobe Timing	u sec	1.75		2.25	
35.A	Amplitude	volts	4.0		10.0	
35.B	Pulse Width	u sec	2.5		3.5	
35.C	Drop	volts			A/5	
35.D	Rise Time	u sec			0.20	
35.E	Backsawing	volts			4.0	
35.F	Noise	volts	0		0.4	
38	LR V <sub>2</sub> Read Cycle Timing	m sec	80.315			
40	LR V <sub>2</sub> Gate Strobe Timing	u sec	1.75		2.25	
41.A	Amplitude	volts	4.0		10.0	
41.B	Pulse Width	u sec	2.5		3.5	
41.C	Drop	volts			A/5	
41.D	Rise Time	u sec			0.20	
41.E	Backsawing	volts			4.0	
41.F	Noise	volts	0		0.4	
44	LR V <sub>2</sub> Read Cycle Timing	m sec	80.315			
46	LR V <sub>2</sub> Gate Strobe Timing	u sec	1.75		2.25	
47.A	Amplitude	volts	4.0		10.0	
47.B	Pulse Width	u sec	2.5		3.5	
47.C	Drop	volts			A/5	
47.D	Rise Time	u sec			.20	
47.E	Backsawing	volts			4.0	
47.F	Noise	volts	0		0.4	

DATE 15 MAR 68

APOLLO 60N  
EQUIPMENT TEST  
DATA SHEET 6 OF 7

JDC  
NO. 12621  
REV. K

JOB LGC OUTPUT TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ/ACC
50	LR V <sub>2</sub> Read Cycle Timing	m sec	80.315			
52	LR V <sub>2</sub> Gate Strobe Timing	u sec	1.75		2.25	
53.A	Amplitude	volts	4.0		10.0	
53.B	Pulse Width	u sec	2.5		3.5	
53.C	Drop	volts			A/5	
53.D	Rise Time	u sec			0.2	
53.E	Backsawing	volts			4.0	
53.F	Noise	P-PV	0		0.4	
56	RR Range Rate Read Cycle Timing	m sec	80.935			
58	RR Range Rate Gate Strobe Timing	u sec	1.75		2.25	
59.A	Amplitude	volts	4.0		10.0	
59.B	Pulse Width	u sec	2.5		3.5	
59.C	Drop	volts			A/5	
59.D	Rise Time	u sec			0.2	
59.E	Backsawing	volts			4.0	
59.F	Noise	P-PV	0		0.4	
62	RR Range Read Cycle Timing	m sec	80.935			
63.A	Amplitude	volts	4.0		10.0	
63.B	Pulse Width	u sec	2.5		3.5	
63.C	Drop	volts			A/5	
63.D	Rise Time	u sec			0.2	
63.E	Backsawing	volts			4.0	
63.F	Noise	P-PV	0		0.4	

DATE 15 MAR 68

APOLLO G&N  
EQUIPMENT TEST  
DATA SHEET 1 OF 1

JOC  
NO. 12621  
REV. K

JOB LOC OUTPUT TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ A/C
66	RR Range Gate Strobe Timing	u sec	1.75		2.25	
66.A	Amplitude	volts	4.0		10.0	
66.B	Pulse Width	u sec	2.5		3.5	
66.C	Droop	volts			A/5	
66.D	Rise Time	u sec			.20	
66.E	Backsawing	volts			4.0	
66.F	Noise	PP-V	0		0.4	
71.A	Amplitude	volts	5.0		9.0	
71.B	Pulse Width	u sec	2.0		6.0	
71.C	Droop	volts			A/5	
71.D	Rise Time	u sec			0.2	
71.E	Backsawing	volts			4.0	
72	DLNK Data Sync Delay Time	u sec			1 u sec	
73.A	Amplitude	volts	5.0		9.0	
73.B	Pulse Width	u sec	2.0		6.0	
73.C	Droop	volts			A/5	
73.D	Rise Time	u sec			0.2	
73.E	Backsawing	volts			4.0	

DATE 15 MAR 68



SUBSYSTEM LEM G &amp; N SYSTEM

ASSY

LR ZA GATE STROBE TIMING TEST

40. Set CHANNEL 8 switches to 118 and set SCOPE switch to S→T.

41. Determine the timing lag of a LR ZA Gate Strobe pulse (T-219) to a LR Reset Strobe pulse (S-118) at their respective A/2 points.

LR ZA GATE STROBE TEST

42. Set SCOPE switch to DIFF T and measure and record the scope indications of A through F represented in figure 1.

LR ZA DATA ACQUISITION TEST

43. Perform following DSKY operations:  
VERB 01 NOUN 01 ENTR  
Address of ZA data

Row 1 shall indicate 77777.

LR YA READ CYCLE TIMING TEST

44. Reset the COUNTER. Set CHANNEL T switches to 218 (LR YA Gate Strobe) and CHANNEL 8 to 314.

45. Press ENTR pushbutton, record COUNTER indication.

LR YA GATE STROBE TIMING TEST

46. Set CHANNEL 8 switches to 118 and SCOPE switch to S→T.

47. Determine the timing lag of a LR YA Gate Strobe pulse (T-218) to a LR Reset Strobe pulse (S-118) at their respective A/2 points.

LR YA GATE STROBE TEST

48. Set SCOPE switch to DIFF T and measure and record the scope indications of A through F represented in figure 1.

LR YA DATA ACQUISITION TEST

55. Perform following DSKY operations:  
VERB 01 NOUN 01 ENTR  
Address of YA data

Row 1 shall indicate 77777.

RR RANGE READ CYCLE TIMING TEST

56. Reset the COUNTER. Set CHANNEL T switches to 215 (RR Range Gate Strobe) and CHANNEL 8 to 313 (RR Sync for Reset).

57. Press ENTR pushbutton, record COUNTER indication.

DATE

SUBSYSTEM LEM G &amp; N SYSTEM

ASSY

RR SYNC FOR READOUT STROBE TEST

58. Set SCOPE switch to DIFF S. Measure and record the scope indications of A through F as represented in figure 1.

RR RANGE GATE STROBE TIMING TEST

59. Set CHANNEL 8 switches to 105 and SCOPE switch to S→T.

60. Determine the timing lag of a RR Range Gate Strobe pulse (T-215) to a RR Reset Strobe pulse (S-105) at their respective A/2 points.

RR RANGE GATE STROBE TEST

61. Set SCOPE switch to DIFF T and measure and record the scope indication of A through F represented in figure 1.

RR RANGE DATA ACQUISITION TEST

62. Perform the following DSKY operations:  
VERB 01 NOUN 01 ENTR  
Address of RR Range data

Row 1 shall indicate 77777.

RR RANGE RATE READ CYCLE TIMING TEST

63. Reset the COUNTER. Set CHANNEL T switches to 216 (RR Range Rate Strobe) and CHANNEL 8 to 313.

64. Press ENTR pushbutton, record COUNTER indications.

RR RANGE RATE GATE STROBE TIMING TEST

65. Set CHANNEL 8 switches to 105 and SCOPE switch to S→T.

RR RANGE RATE GATE STROBE TEST

66. Determine the timing lag of a RR Range Rate Gate Strobe pulse (T-216) to a RR Reset Strobe pulse (S-105) at their respective A/2 points.

RR RANGE RATE GATE STROBE TEST

67. Set SCOPE switch to DIFF T and measure and record the scope indication of A through F respectively in figure 1.

RR RANGE RATE DATA ACQUISITION TEST

68. Perform the following DSKY operations:  
VERB 01 NOUN 01 ENTR  
Address of RR Range data

Row 1 shall indicate 77777.

DOWNLINK TELEMETRY TEST

70. Perform the following DSKY operations:  
VERB 01 NOUN 01 ENTR  
Address of RR Range data

Row 1 shall indicate 77777.

DOWNLINK TELEMETRY TEST

71. Press STBY pushbutton on DSKY.

72. Press DL ENABLE and WORD RATE 50 PPS pushbuttons.

73. Set CHANNEL T switches to 102 (DLNK DATA) and measure and record the scope indications of A, B, D, E and F as represented in figure 1.

74. Set SCOPE switch to S→T and CHANNEL 8 switches to 307 (DLNK SYNC). Measure and record the delay of the DLNK DATA pulse with respect to the DLNK SYNC pulse.

DATE

APOLLO 66N

EQUIPMENT TEST

DATA SHEET 1 OF 2

JOB LGC OUTPUT TEST

ASSEMBLY UNDER TEST

TITLE

SER. NO.

DWG

REV

DATE

TIME

START

END

TOTAL ELAPSED

TEST HISTORY

MAJOR GROUND SUPPORT EQUIPMENT

NAME

SER. NO.

CAL DATE

NAME

SER. NO.

CAL DATE

CONDUCTED BY

NAME/AFFILIATION

APPROVED BY

NAME/AFFILIATION

JDC

ITEM

NO.

PARAMETER

UNITS

MIN

VALUE

RECORDED VALUE

MAX

REJ ACC

4.a.

RCS JET -X4U

vdc

2.0

5.0

4.b.

RCS JET -X4D

vdc

2.0

5.0

4.c.

RCS JET -X3U

vdc

2.0

5.0

4.d.

RCS JET -X2U

vdc

2.0

5.0

4.e.

RCS JET -X2D

vdc

2.0

5.0

4.f.

RCS JET -X1U

vdc

2.0

5.0

4.g.

RCS JET -X1D

vdc

2.0

5.0

4.h.

RCS JET -X4U

vdc

9.0

11.0

4.i.

RCS JET -X4D

vdc

9.0

11.0

4.j.

RCS JET -X3U

vdc

9.0

11.0

4.k.

RCS JET -X3D

vdc

9.0

11.0

4.l.

RCS JET -X2U

vdc

9.0

11.0

4.m.

RCS JET -X2D

vdc

9.0

11.0

4.n.

RCS JET -X1U

vdc

9.0

11.0

4.o.

RCS JET -X1D

vdc

9.0

11.0

4.p.

RCS JET -X4U

vdc

9.0

11.0

4.q.

RCS JET -X4D

vdc

9.0

11.0

4.r.

RCS JET -X3U

vdc

9.0

11.0

4.s.

RCS JET -X3D

vdc

9.0

11.0

4.t.

RCS JET -X2U

vdc

9.0

11.0

4.u.

RCS JET -X2D

vdc

9.0

11.0

4.v.

RCS JET -X1U

vdc

9.0

11.0

4.w.

RCS JET -X1D

vdc

9.0

11.0

4.x.

RCS JET -X4U

vdc

9.0

11.0

4.y.

RCS JET -X4D

vdc

9.0

11.0

4.z.

RCS JET -X3U

vdc

9.0

11.0

4.aa.

RCS JET -X3D

vdc

9.0

11.0

4.ab.

RCS JET -X2U

vdc

9.0

11.0

4.ac.

RCS JET -X2D

vdc

9.0

11.0

4.ad.

RCS JET -X1U

vdc

9.0

11.0

4.ae.

RCS JET -X1D

vdc

9.0

11.0

4.af.

RCS JET -X4U

vdc

9.0

11.0

4.ag.

RCS JET -X4D

vdc

9.0

11.0

4.ah.

RCS JET -X3U

vdc

9.0

11.0

4.ai.

RCS JET -X3D

vdc

9.0

11.0

4.aj.

RCS JET -X2U

vdc

9.0

11.0

4.ak.

RCS JET -X2D

vdc

9.0

11.0

4.al.

RCS JET -X1U

vdc

9.0

11.0

4.am.

RCS JET -X1D

vdc

9.0

11.0

4.an.

RCS JET -X4U

vdc

9.0

11.0

4.ao.

RCS JET -X4D

vdc

9.0

11.0

4.ap.

RCS JET -X3U

vdc

9.0

11.0

4.aq.

RCS JET -X3D

vdc

9.0

11.0

4.ar.

RCS JET -X2U

vdc

9.0

11.0

4.as.

RCS JET -X2D

vdc

9.0

11.0

4.at.

RCS JET -X1U

vdc

9.0

11.0

4.au.

RCS JET -X1D

vdc

9.0

11.0

4.av.

RCS JET -X4U

vdc

9.0

11.0

4.aw.

RCS JET -X4D

vdc

9.0

11.0

4.ax.

RCS JET -X3U

vdc

9.0



APOLLO G&N  
EQUIPMENT TEST  
DATA SHEET 2 OF 9

JDC  
NO. 12621  
REV. -

JOB LGC OUTPUT TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ ACC
7.d.	RCS JET +Z2F	vdc	2.0		5.0	
7.e.	RCS JET +Y2S	vdc	2.0		5.0	
7.f.	RCS JET -Y3S	vdc	2.0		5.0	
7.g.	RCS JET -Y4S	vdc	2.0		5.0	
7.h.	RCS JET -Y1S	vdc	2.0		5.0	
9.a.	RCS JET +Z3F	vdc	9.0		11.0	
9.b.	RCS JET -Z4F	vdc	9.0		11.0	
9.c.	RCS JET -Z1F	vdc	9.0		11.0	
9.d.	RCS JET +Z2F	vdc	9.0		11.0	
9.e.	RCS JET +Y2S	vdc	9.0		11.0	
9.f.	RCS JET -Y3S	vdc	9.0		11.0	
9.g.	RCS JET -Y4S	vdc	9.0		11.0	
9.h.	RCS JET -Y1S	vdc	9.0		11.0	
10.a.	ENG ON	vdc	2.0		5.0	
10.b.	ENG OFF	vdc	2.0		5.0	
12.a.	ENG ON	vdc	9.0		11.0	
12.b.	ENG OFF	vdc	9.0		11.0	
13.a.	+ PITCH GIMBAL TRIM	vdc	2.0		5.0	
13.b.	- PITCH GIMBAL TRIM	vdc	2.0		5.0	
13.c.	+ ROLL GIMBAL TRIM	vdc	2.0		5.0	
13.d.	-ROLL GIMBAL TRIM	vdc	2.0		5.0	
16.a.	+ PITCH GIMBAL TRIM	vdc	9.0		11.0	

DATE

APOLLO G&N  
EQUIPMENT TEST  
DATA SHEET 3 OF 9

JDC  
NO. 12621  
REV. -

JOB LGC OUTPUT TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ ACC
16.b.	- PITCH GIMBAL TRIM	vdc	9.0		11.0	
16.c.	+ ROLL GIMBAL TRIM	vdc	9.0		11.0	
16.d.	- ROLL GIMBAL TRIM	vdc	9.0		11.0	
18	INCR THROTTLE RATE DESC ENG					
18A	Amplitude	volts	4		10	
18B	Pulse Width	usec	2.0		4.0	
18C	Backsawing	volts			4.0	
18D	Droop	volts			+A/5	
18E	Rise Time	usec			0.20	
18F	Noise	volts	-4.0		+0.4	
20	DECR THROTTLE RATE DESC ENG					
20A	Amplitude	volts	4.0		10.0	
20B	Pulse Width	usec	2.0		4.0	
20C	Backsawing	volts			4.0	
20D	Droop	volts	-A/5		+A/5	
20E	Rise Time	usec			0.20	
20F	Noise	volts	-4.0		+0.4	
22A	ALTITUDE "1"					
22AA	Amplitude	volts	4.0		10.0	
22AB	Pulse Width	usec	2.0		4.0	
22AC	Backsawing	volts			4.0	

DATE

APOLLO G&N  
EQUIPMENT TEST  
DATA SHEET 4 OF 9

JDC  
NO. 12621  
REV. -

JOB LGC OUTPUT TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ ACC
22AD	Droop	volts			+A/5	
22AE	Rise Time	usec			0.2	
22B	ALTITUDE "0"					
22BA	Amplitude	volts	4.0		10.0	
22BB	Pulse Width	usec	2.0		4.0	
22BC	Backsawing	volts			4.0	
22BD	Droop	volts			+A/5	
22BE	Rise Time	usec			0.2	
24A	ALTITUDE RATE "1"					
24AA	Amplitude	volts	4.0		10.0	
24AB	Pulse Width	usec	2.0		4.0	
24AC	Backsawing	volts			4.0	
24AD	Droop	volts			+A/5	
24AE	Rise Time	usec			0.2	
24B	ALTITUDE RATE "0"					
24BA	Amplitude	volts	4.0		10.0	
24BB	Pulse Width	usec	2.0		4.0	
24BC	Backsawing	volts			4.0	
24BD	Droop	volts			+A/5	
24BE	Rise Time	usec			0.2	

DATE

APOLLO G&N  
EQUIPMENT TEST  
DATA SHEET 5 OF 9

JDC  
NO. 12621  
REV. -

JOB LGC OUTPUT TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ ACC
26A	RR Reset Strobe					
26AA	Amplitude	volts	4.0		10.0	
26AB	Pulse Width	usec	2.5		3.5	
26AC	Backsawing	volts			4.0	
26AD	Droop	volts			+A/5	
26AE	Rise Time	usec			0.2	
26AF	Noise	volts			+0.4	
26B	LR Reset Strobe					
26BA	Amplitude	volts	4.0		10.0	
26BB	Pulse Width	usec	2.5		3.5	
26BC	Backsawing	volts			4.0	
26BD	Droop	volts			+A/5	
26BE	Rise Time	usec			0.2	
26BF	Noise	volts			+0.4	
31	LR RANGE READ CYCLE TIMING	usec	60.315			
32	LR RANGE GATE STROBE					
32A	Amplitude	volts	4.0		10.0	
32B	Pulse Width	usec	2.5		3.5	
32C	Backsawing	volts			4.0	
32D	Droop	volts			+A/5	
32E	Rise Time	usec			0.2	
32G	Noise	volts			+0.4	

DATE

APOLLO G&N  
EQUIPMENT TEST  
DATA SHEET 6 OF 9

JDC  
NO. 12621  
REV. -

JOB LGC OUTPUT TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ ACC
35	LR RANGE GATE STROBE TIMING	usec	1.75		2.25	
36	LR SYNC FOR READOUT STROBE					
36A	Amplitude	volts	4.0		10.0	
36B	Pulse Width	usec	2.5		3.5	
36C	Backsawing	volts			4.0	
36D	Droop	volts			+A/5	
36E	Rise Time	usec			0.2	
36F	Noise	volts			+0.4	
39	LR ZA READ CYCLE TIMING	usec	80.315			
41	LR ZA GATE STROBE TIMING	usec	1.75		2.25	
42	LR ZA GATE STROBE					
42A	Amplitude	volts	4.0		10.0	
42B	Pulse Width	usec	2.5		3.5	
42C	Backsawing	volts			4.0	
42D	Droop	volts			+A/5	
42E	Rise Time	usec			0.2	
42F	Noise	volts			+0.4	
45	LR YA READ CYCLE TIMING	usec	80.315			

DATE \_\_\_\_\_

APOLLO G&N  
EQUIPMENT TEST  
DATA SHEET 7 OF 9

JDC  
NO. 12621  
REV. -

JOB LGC OUTPUT TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ ACC
47	LR YA GATE STROBE TIMING	usec	1.75		2.25	
48	LR YA GATE STROBE					
48A	Amplitude	volts	4.0		10.0	
48B	Pulse Width	usec	2.5		3.5	
48C	Backsawing	volts			4.0	
48D	Droop	volts			+A/5	
48E	Rise Time	usec			0.2	
48F	Noise	volts			+0.4	
51	LR XA READ CYCLE TIMING	usec	80.315			
53	LR XA GATE STROBE TIMING	usec	1.75		2.25	
54	LR XA GATE STROBE					
54A	Amplitude	volts	4.0		10.0	
54B	Pulse Width	usec	2.5		3.5	
54C	Backsawing	volts			4.0	
54D	Droop	volts			+A/5	
54E	Rise Time	usec			0.2	
54F	Noise	volts			+0.4	
57	RR RANGE READ CYCLE TIMING	usec	80.935			
59	RR SYNC FOR READOUT					

DATE \_\_\_\_\_

APOLLO G&N  
EQUIPMENT TEST  
DATA SHEET 8 OF 9

JDC  
NO. 12621  
REV. -

JOB LGC OUTPUT TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ ACC
59A	Amplitude	volts	4.0		10.0	
59B	Pulse Width	usec	2.5		3.5	
59C	Backsawing	volts			4.0	
59D	Droop	volts			+A/5	
59E	Rise Time	usec			0.2	
59F	Noise	volts			+0.4	
60	RR RANGE GATE STROBE TIMING	usec	80.935			
61	RR RANGE GATE STROBE					
61A	Amplitude	volts	4.0		10.0	
61B	Pulse Width	usec	2.5		3.5	
61C	Backsawing	volts			4.0	
61D	Droop	volts			+A/5	
61E	Rise Time	usec			0.2	
61F	Noise	volts			+0.4	
64	RR RANGE RATE READ CYCLE TIMING	usec	80.935			
66	RR RANGE RATE STROBE TIMING	usec	1.75		2.25	
67	RR RANGE RATE STROBE					
67A	Amplitude	volts	4.0		10.0	
67B	Pulse Width	usec	2.5		3.5	
67C	Backsawing	volts			4.0	

DATE \_\_\_\_\_

APOLLO G&N  
EQUIPMENT TEST  
DATA SHEET 9 OF 9

JDC  
NO. 12621  
REV. -

JOB LGC OUTPUT TEST

JDC ITEM NO.	PARAMETER	UNITS	MIN VALUE	RECORDED VALUE	MAX VALUE	REJ ACC
67D	Droop	volts			+A/5	
67E	Rise Time	usec			0.2	
67G	Noise	volts			+0.4	
73	TELEMETRY DLNK DATA					
73A	Amplitude	volts	5.0		9.0	
73B	Pulse Width	usec	2.0		6.0	
73D	Droop	volts			+A/5	
73E	Rise Time	usec			0.2	
73G	Noise	volts	-6.0		+0.4	
74	DLNK DATA- SYNC DELAY TIME	usec			1.0	
75	DLNK DATA- SYNC DELAY TIME (10 PPS)	usec			1.0	
3,5,8, 11,14, 15,19, 22,23, 25,37, 43,49, 55,62, 68,77	DISPLAYS (Resected as specified)					

DATE \_\_\_\_\_